Rural household livelihoods, crop production and well-being after a period of trade reforms: a case study of Rukwa, Tanzania

Thesis submitted to the University of Sussex in partial fulfilment of the requirements for the degree of Doctor of Philosophy

Justin Kalisti Urassa

School of Global Studies

University of Sussex, Brighton

September 2010

Declaration

I hereby declare that this thesis has not been and will not be, submitted, in whole or in part to another University for the award of any degree. However, the thesis incorporates to the extent indicated below, material already submitted as part of a degree of:

M.Sc. Social Research Methods (Development Studies)

This was awarded by University of Sussex.

.....

Justin Kalisti Urassa

ABSTRACT

Production of staples occupies an important part in Sub-Saharan Africa's crop production, and maize is its single most important food staple. This thesis mainly examines the role of maize in farmers' livelihoods and wellbeing in Tanzania, in the context of a long period of reforms that have affected both the maize market, agriculture more widely. It does so by exploring the role of maize in household's on and off-farm diversification, the determinants of crop productivity, and the relationship between diversification, commercialisation and' well-being. A number of specific issues are explored including the importance of factors such as farm size and education, access to key inputs such as seeds, fertilizers and agricultural extension services. The thesis uses data collected from three districts of Rukwa, one of Tanzania's major maize producing regions, and some secondary agricultural data from official sources. The research found that households with more land were generally more diversified (both on-farm and off-farm) than those with less land, and they experienced higher levels of well-being as measured by a range of concepts of well-being, but that maize continues to play an important role households' livelihoods and well-being. The research also revealed low levels of use of important agricultural inputs such as modern fertilizers and extension services, which may explain the low yields observed in the region. Education emerged as an important factor in raising yields, increasing commercialisation and also well-being, suggesting that non-agriculture policies may also be important for improving productivity and welfare of farmers. Despite the importance of crop production to their' well-being, households face several constraints; these include access to fertilizers, improved seeds and other chemical inputs necessary for higher production, and extension services. These findings have important policy implications as many rural households continue to rely on agriculture, especially production of staples. Therefore, these results could help the central and local governments to formulate strategies geared towards improving rural well-being.

DEDICATION

I dedicate this work to my wife, Halima H. Mwanyika, My children, Mary, Elihudi and Elineema, My father, Kalisti and Mother, Theresia and all the smallholder maize farmers toiling to provide food for the ever growing Tanzanian population.

TABLE OF CONTENTS

Abstract		**Iii**
List of Abbreviations		**Ix**
List of Tables		**X**
List of Figures		**xii**
List of Appendices		**xiii**
Chapter One		**1**
1.1	Introduction	1
1.2	Objectives of the Study	6
1.3	Organization of the Study	8
Chapter two: Literature review		**11**
2.0	Introduction	11
2.1	Conceptualization of key terminologies	11
2.1.1	What are rural areas?	11
2.1.4	What are livelihoods?	12
2.1.2	What is well-being?	13
2.2	Literature review on diversification of rural livelihoods	13
2.2.1	Diversification of rural livelihoods	14
2.2.2	Rural livelihood diversification strategies	16
2.2.3	Limitations on diversification of livelihood strategies	17
2.3	Crop production in Sub-Saharan Africa	18
2.3.1	Factors affecting crop production in Sub-Saharan Africa	18
2.4	Conclusions	21
Chapter Three: Research Methodology		**22**
3.0	Introduction	22
3.1	Description of the study area	22
3.1.1	Geographic location	22
3.1.2	Rukwa's administrative units	22
3.1.3	Rukwa's socio-economic characteristics	23
3.1.4	Agro-ecological characteristics	24
3.2	Types of available data	26
3.2.1	Data on agricultural production	26
3.2.2	Data on living standards	28
3.2.3	Some other data sets/studies conducted in Tanzania addressing rural poverty whose data was available for use by the current study	29
3.3	The need to use primary field data	30

3.4	Methods of data collection	31
3.4.1	Research design	31
3.4.2	Data collection, analysis and presentation	31
3.4.3	Sampling and sample size	31
3.4.4	Primary data collection	32
3.4.5	Secondary data collection	34
3.5	Study limitations	34
3.5.1	Use of recall data in social science surveys, its limitations and how to improve the reliability of recall data	34
3.5.2	Actual field limitations	38
3.6	Socio-economic characteristics of surveyed households	40
Chapter Four: An overview of Tanzania's Agriculture		**43**
4.0	Introduction	43
4.1	An overview of Tanzania's agricultural sector reforms	43
4.3	Tanzania's crop production trends of five selected crops	48
4.2.1	Food crop production trends	48
4.2.2	Cash crop production trends	51
4.3	Maize production in Tanzania before and after liberalization of the maize market	57
4.3.1	The historical background of Tanzania's maize production	59
4.3.2	Maize production in Tanzania: levels and trends	60
4.3.3	Factors affecting maize production in Tanzania	63
4.3	Conclusions	67
Chapter Five: Diversification of households' livelihood strategies		**69**
5.0	Introduction	69
5.1	The conceptual framework	73
5.2	Crop diversification by households	76
5.3	Farm size, fragmentation and crop diversification	80
5.4	Other household socio-economic characteristics and crop diversification	84
5.5	Household livelihood diversification	90
5.6	Farm characteristics and households' diversification of livelihood strategies	94
5.7	Household characteristics and diversification of livelihood strategies	95
5.8	A comparison of crop diversification for households that were in maize production in 1986	104
5.9	Conclusions	106

Chapter Six: Crop production in Rukwa region 108
6.0 Introduction 108
6.1 The conceptual framework 109
6.2 An overview of crop production by households 110
6.2.1 Production of food crops 110
6.2.2 Production of cash crops 112
6.3. Maize production in Rukwa 113
6.3.1 Levels and trends of maize production 113
6.3.2 Problems faced by households producing maize in Rukwa region 118
6.3.3 Factors influencing Rukwa households' maize production 121
6.4 Maize marketing 126
6.4.1 Introduction 126
6.4.2 Maize marketing characteristics by households 126
6.4.2 Respondents' opinions on maize marketing in their area 130
6.4.3 Respondents' views on liberalization of the maize market 133
6.5 Conclusions 135

Chapter Seven: Well-being among rural households in Rukwa 138
7.0 Introduction 138
7.1 Conceptual framework for determining well-being of the surveyed households 139
7.2 Well-being in Rukwa 142
7.3 The relationship between maize farming and households' well-being 145
7.3.1 Maize farming as a source of household cash income 146
7.3.2 Maize farming and asset ownership 147
7.3.3 Maize farming and households ability to meet costs for health, education, social activities costs and their ownership of a good quality house in 2006 148
7.3.4 Factors influencing the surveyed households' income, assets and their ability to meet costs for health, education and social activities. 151
7.4 Maize farming as a poverty escape 157
7.5 A comparison of household well-being between 2005 and 1986 for households in crop production in 1986 160
7.6 Conclusions 163
Chapter Eight: Summary, conclusions and recommendations 165
References 174
Appendices 191

ACKNOWLEDGEMENTS

First and foremost, I wish to thank the Almighty God for His blessings throughout the period of the study.

Secondly, I wish to thank my supervisors, Dr. Julie Litchfield of the Economics Department at University of Sussex and Professor Roderick Stirrat of the Centre for the Comparative Study of Culture, Development and the Environment (who retired in June 2009 before completion of the study) of their intellectual advice, personal-commitment, assistance and intensive supervision from the very beginning of this study until its completion.

Thirdly, I wish to thank the Commonwealth Scholarship Commission (CSC) (UK) for sponsoring my studies at University of Sussex and the British Council for their smooth administration of my grant. Special gratitude is extended to REPOA for sponsoring the main part of my research. I also feel indebted to Prof. Mwageni, the then Director of the Development Studies Institute (DSI) of Sokoine University of Agriculture, Tanzania for the additional funds that enabled the smooth administration of my field work in Rukwa and acquisition of some secondary data.

I also wish to appreciate the assistance given to me by the district agricultural officers Mr Mwambeni of Sumbawanga rural, Mr. Angasisye of Mpanda District, and Mr Mushila of Nkansi District. Together with the agricultural officers I wish to thank Respich, Kibona and Shomari for assisting me with arrangements for the actual field work in the villages. I also extend my gratitude to my research assistants, Mwamkinga and Banga, and our driver Arkadi. Special appreciation is extended to all the respondents who sacrificed their valuable time and without whose cooperation this work would have been impossible to accomplish.

I also thank Rukwa's regional administrative secretary and the district administrative secretaries for Sumbawanga, Mpanda and Nkansi districts for granting permission for my research. Last, but not least I thank all those who in one way or the other assisted me in accomplishing this work; all that you did for me is highly appreciated and may God bless you abundantly.

LIST OF ABBREVIATIONS

AGREST	Agricultural Economics Society of Tanzania
CIMMYT	International Maize and Wheat Improvement Center
FAO	Food and Agriculture Organization of the United Nations
FGDs	Focus Group Discussions
FHH	Female headed households
IFAD	International Fund for Agricultural Development
IFPRI	International Food Policy Research Institute
IMF	International Monetary Fund
LS	Livelihood Strategies
MAC	Ministry of Agriculture and Cooperatives
MAFS	Ministry of Agriculture and Food Security
MALD	Ministry of Agriculture and Livestock Development
MCM	Ministry of Cooperatives and Marketing
MFEA-Z	Ministry of Finance and Economic Affairs Zanzibar
MWLD	Ministry of Water and Livestock Development
MHH	Male Headed households
NBS	National Bureau of Statistics Tanzania
NMC	National Milling Cooperation
OCOL	Office of the Commissioner of Official languages
PORALG	President's Office, Regional Administration and Local Government
RATES	Regional Agricultural Trade Expansion Support Program
REPOA	Research on Poverty Alleviation
RRCO	Rukwa Regional Commissioners' Office
SAA	Sasakawa African Association
SAPs	Structural Adjustment Programmes
TFC	Tanzania fertilizer Company
Tsh	Tanzanian Shilling
UN	United Nations
UNCTAD	United Nations Conference on Trade and Development
URT	United Republic of Tanzania
USAID	United States Agency for International Development
WB	World Bank

LIST OF TABLES

Table 2.1: Categories of rural livelihood strategies 17

Table 3.1: Socio-economic characteristics of households 42

Table 5.1: Households' crop diversification in 2005 77

Table 5.2: Crop production by households in 2005 78

Table 5.3: Crop diversification combinations by households in 2005 80

Table 5.4: Households' farm characteristics and crop diversification in 2005 81

Table 5.5: Crop diversification on basis of percentage of land allocated to maize, other food and cash crops as per households' farm characteristic 82

Table 5.6: Crop diversification on the basis of a household's method of land preparation 83

Table 5.7: Crop diversification on basis of percentage of land allocated to maize, other food and cash crops relative to households socio-economic characteristics 85

Table 5.8: Households' crop diversification in 2005 88

Table: 5.9: Livelihood strategies adopted by households in 2005 92

Table 5.10: Diversification of household's LS by categories and number of LS adopted on basis of farmland characteristics 95

Table 5.11: Diversification of household's LS by categories of adopted strategies 97

Table 5.12: Diversification of household's LS by number of strategies adopted 98

Table 5.13: Distribution of reported livelihood strategies by household's head's sex, households income status and its sale of maize 100

Table 5.14: Distribution of reported livelihood strategies by their crop sale characteristics 101

Table 5.15: Household size and diversification of household's LS by categories and number of LS adopted 103

Table 5.16: Crop diversification combinations by households in production in 1986 105

Table 5.17: Crop diversification by number of crops and farm allocation 106

Table 6.1: Crop yield levels of selected food crops in Rukwa and the surveyed households for the 2004/05 season 112

Table 6.2: Households' maize production in Rukwa for the 2005 cropping season 115

Table 6.3: Rukwa households' use of modern technologies in maize production in 2005 by numbers and percentage 116

Table 6.4: Problems faced by households producing maize in Rukwa 121

Table 6.5: Simple linear of the natural logarithms of the surveyed households' 2005 maize yields (kg/ha) and output (kg) in 2005 123

Table 6.6: Maize marketing by households that actually sold maize in 2005 127

Table 6.7: Main buyers of surveyed households' maize in 2005 128

Table 6. 8: Surveyed households maize price summary statistics based on location and buyer 129

Table 6.9: Source of maize market information by households selling maize in 2005 130

Table 6.10: Respondents' opinion on maize marketing in their area 132

Table 6.11: Respondents' opinions on some aspects of the liberalized maize market 135

Table 7.1: Well-being indicators 145

Table 7.2.: The contribution of maize sales to household income in 2005 146

Table 7.3: Households' income (2005) and assets (2006) 148

Table 7.4: The contribution of maize farming to households' well-being in Rukwa 150

Table 7.5: Simple linear and binary logistic regression analysis results for some household well-being indicators 156

Table 7.6: Respondents' opinions on maize farming's potential for poverty reduction in their area 160

Table 7.7: A comparison of real annual incomes, asset value and ownership of good quality house for households in maize production in 1986 and 2006 161

Table 7.8: Income and assets value increase for households in maize production in 1986 162

Table 7.9: A comparison of ability for households in maize production in 1986 and 2005 to afford their health, education and social activities costs 163

LIST OF FIGURES

Figure 3.0: Map of Tanzania 25

Figure 3.1: Map of Tanzania Showing Administrative Regions 25

Figure 3.2: Rukwa Region's Administrative Districts 25

Figure 4.1: Tanzania's bean production trend 1966 - 2006 49

Figure 4.2: Tanzania's rice/paddy production trend 1966 -2006 51

Figure 4.3: Tanzania's groundnuts production trend 1966 - 2006 53

Figure 4.4: Tanzania's sunflower production trend 1966 - 2006 54

Figure 4.5: Tanzania's tobacco production trend 1966 - 2006 57

Figure 4.6: Tanzania's maize production trend 1966 - 2006 61

Figure 4.7: Maize as a proportion of total cereals and preferred staples, 1962 - 2005 62

Figure 4.8: Tanzania's maize production, yield, area under production and prices for the period 1989/90 - 2003/04 67

Figure 5.1: The DFID Livelihoods framework 75

Figure 5.2: Basic alternatives in rural diversification strategies 75

LIST OF APPENDICES

Appendix 3.0: Rukwa's agro-ecological/economic zones 191

Appendix 3.1: Tanzania's 2002/03 Agriculture Census Sample Design 191

Appendix 3.2: Villages and Number of Households Involved in the Study on Maize Market Liberalization and Poverty Reduction; A Case Study of Rukwa Region, Tanzania 192

Appendix 3.3: Questionnaire Used in the Research on Maize Market Liberalization and Poverty Reduction in Rural Areas: A Case Study of Rukwa Region, Tanzania 193

Appendix 3.4: Definitions of variables used in the study 201

Appendix 3.5(A translated version Appendix 3.2): Hojaji Itakayotumika Katika Utafiti wa Soko Huria la Mahindi na Upunguzaji Umaskini Katika Sehemu za Vijijini: Uchunguzi Kifani Mkoani Rukwa, Tanzania. 202

Appendix 3.6: Check List to be Used in the Focus Group Discussions and In-depth Interviews in the Research on Maize Market Liberalization and Poverty Reduction in Rural Areas: A Case Study of Rukwa Region, Tanzania 209

Appendix 3.7: Informed consent form for the DPhil research titled: Maize Market Liberalization and Poverty Reduction in Rural Areas: A case Study of Rukwa Region, Tanzania 211

Appendix 3.8 (Translated version of Appendix 3.8): Fomu ya Ukubali wa Wakulima wa Mahindi Mkoani Rukwa Kushiriki Utafiti Unaohusu Ulegezwaji Wa Masharti ya Soko la Mahindi na Upunguzaji wa Umasikini Mkoani Rukwa, Tanzania 212

Appendix 4.1: Categorization of Tanzania's mainland regions based on their average maize production for the period 1983/84 – 2002/03 213

Appendix 4.2: Tanzania's bean production trend 1986 -2006 213

Appendix 4.3: Tanzania's rice/paddy production trend for the period 1986 - 2006 214

Appendix 4.4: Tanzania's groundnut production 1986 - 2006 214

Appendix 4.5: Tanzania's sunflower production trend 1966 - 1985 215

Appendix 4.6: Tanzania's sunflower production trend 1986 - 2006 215

Appendix 4.7: Tanzania's tobacco production trend 1966 - 1985 216

Appendix 4.8: Tanzania's tobacco production trends 1986-2006 216

Appendix 4.9: Rukwa's percentage land allocation to major cereals, 1983/84 - 2004/05 217

Appendix 4.10: A Summary of Tanzania's Farming Systems 217

Appendix 4.11: Agro-Ecological zones of Tanzania 218

Appendix 4.12: Maize area and yield by region, Tanzania as per the 2002/2003 Agricultural Census 219

Appendix 4.13: Tanzania's maize production trend 1966 - 1986 220

Appendix 4.14: Tanzania maize production trend 1987 - 2006 220

Appendix 4.15: Correlation analysis results for average wholesale price and maize output, 221

yield and area cultivated

Appendix 4.16: Rukwa's rainfall, maize production and yield trends for the period 1983/84 - 2004/05 221

Appendix 4.17: Correlations analysis results for rainfall and maize production and yield in six selected regions of Tanzania for the period 1986/87 – 2004/05 221

Appendix 5.1: Crop diversification combinations by households in 2005 222

Appendix 5.1a: Correlations analysis results for various farm characteristics by age and education level of household's head 224

Appendix 5.2: Correlations analysis results between various socio-economic characteristics of the household heads and number of crops grown by households 224

Appendix 5.3: ANOVA Results for some of households' socio-economic characteristics and their influence on a household's diversification of crops grown on basis of land allocated to maize production. Food crops and cash crops 225

Appendix 5.4: ANOVA results for some of households' socio-economic characteristics and households LS 225

Appendix 5.5: ANOVA results for number of plots owned, household size and number of children less than 15 years as per household head's gender 226

Appendix 5.6: Households' socio-economic characteristics on basis of the education of household heads 226

Appendix 5.7: Households' socio-economic characteristics on basis of reported 2005 total income 227

Appendix 5.8: ANOVA results for households' income status and farm land owned in 2005 227

Appendix 5.9: Activity status of Tanzania's children (5 – 17) in 2000/2001 227

Appendix 5.10: T-test results for households in maize production in 1986: paired sample test for farm land, % of farm allocated to maize, other food crops and cash crops 228

Appendix 6.1: Productivity (kg/ha) of selected food and cash crops for selected regions of Tanzania for the 2004/05 season 229

Appendix 6.2: Average crop yields (Kg/ha) across the world 230

Appendix 6.3 Maize marketing by surveyed households in 2005 231

Appendix 6.4: Surveyed households maize marketing summary statistics on basis of buyer 231

Appendix 6.5: Distribution of surveyed households based on size of maize output 231

Appendix 6.6: Distribution of surveyed households based on maize market distance 231

Appendix 6.7: Respondents' opinion on maize marketing in their area 232

Appendix 7.1: Paired samples test for adjusted 1986 and 2005 household's annual income and adjusted 1986 and 2006 assets value 232

Chapter One: Introduction

1.1 Introduction

This thesis examines the role of maize in farmers' livelihoods and wellbeing in the context of a long period of reforms, that have affected both the maize market, agriculture more generally and other aspects of people's lives such as health and education. The research examines issues around maize and other agricultural production, the relationships between diversification both on and off farm, commercialisation and well-being. The thesis explores a number of debates around the importance of specialisation versus diversification both on and off-farm, the role of farm size in households' diversification of livelihood strategies (LS) and their well-being, farm households' access to agricultural inputs and extension services and crop production. The thesis also explores how farmers' characteristics influence households' LS, their crop production and general well-being.

Tanzania's economy is predominantly agriculture based and this may continue into the foreseeable future. The sector accounts for about half of the national income and three quarters of merchandise exports, is the major source of food, and provides employment opportunities to about 80 percent of Tanzanians (URT, 2004). The majority of players in the agricultural sector are smallholder farmers (peasants) cultivating small farms[1]. According to NBS et al. (2006) 70% of Tanzania's crop area is cultivated by hand hoe. Generally, food crop production dominates the agriculture economy; of the 5.1 million ha cultivated annually 85 percent is under food crops. According to the National Bureau of Statistics (NBS) (2008) most rural households in Tanzania earn their cash incomes from the sale of food and cash crops. However, the 2008 WDR (WB, 2007) shows that households diversifying their livelihood strategies were the most successful in moving out of poverty; such households diversified their farming activities by growing food crops for their own consumption and non-traditional cash crops as well as raising livestock.

The importance of diversification of LS by rural households is widely reported in literature[2]. For example Warren (2002) points out that findings from anthropological studies have shown that rural households have for a long time practiced diverse LS whereby the majority of rural population in both developed and developing countries have survived and reproduced by growing a mix of staple and cash crops, keeping some livestock, fishing, and gathering forest products. He adds that diversification of livelihoods is a fundamental attribute of many rural livelihood strategies. Escobar (1995), cited by Warren (2002), argues that some earlier approaches intended to improve the well-being of rural communities, for example the 'green revolution' which aimed at making available incentives and assistance aimed at increasing small farms' outputs, and the 'industry first' imperative, which aimed at creating employment opportunities with the objective of transferring surplus rural labour outside small-scale, farming only achieved partial success.

[1] The average farm size ranges between 0.9 and 3.0 hectares (ha) (NBS et al. , 2006).
[2] Alderman and Garcia, 1993; Deacon and Krishnan, 1996; Chambers, 1997; Ellis 1998; Ersado, 2003; Barret et al., 2001; Carswell, 2002; Satge, 2002 and Warren, 2002.

According to Escobar the partial failure of these two approaches was due to the belief that rural development could be brought about by increase in absolute economic growth through intensification of production, economies of scale and market expansion, and due to underplaying the role of diversification of rural LS. Based on this, Warren (2002) argues that recent research has tried to address the development of small rural enterprises in the framework of a more comprehensive analysis of the way in which agricultural intensification and off-farm diversification are combined by rural people as an adaptive response to short and long-term environmental, economic-political and socio-cultural change. Warren further argues that this approach is instrumental in the successful promotion of small rural enterprises as a means to achieve more sustainable rural livelihoods. Literature on risk[3] shows that farmers may adopt *ex ante* risk coping strategies, for example spreading their efforts across a range of different low-risk and low-return activities, on and off-farm, that result in lower productivity and output across individual activities. For example Fafchamps (2003) points out that as a way of coping with risk rural communities diversify their crop production, particularly in areas with less extreme climatic conditions, through planting of different crops or several varieties of the same crop to obtain a more stable output. Dercon (2005) argues that due to risk aversion poor rural households fail to take advantage of profitable activities even when growth opportunities are present in the economy; as a consequence they are left behind because of failing to take on riskier but profitable activities.

The role of farm size in productivity is again being debated[4]. For example Carter (1984) observed that despite small farms being technically inefficient with regard to inputs use, they were nonetheless more productive per unit of land used relative to larger farms[5]. Similar observations have been reported by Hazell et al. (2007) and Thapa (2007). According to Thapa the higher productivity of small farms relative to larger farms is mainly due to their use of more input and labour per hectare than do large farms. However, Hopper et al. (2002) argue that larger farms are typically more profitable than smaller farms, with the gap between them increasing. Mahesh (2000) on the other hand argues that though there might be some correlation between farm size and productivity it should nonetheless be understood that farm productivity may be related not to the size of farm only, but to a complex of various other factors such as choice of crops, administration of inputs at the right time and management of crop-related activities[6].

In addition to the debate on farm size and productivity there are also concerns regarding the importance of small farms to rural households' well-being[7]. For example literature[8] shows that a household's farm size and fragmentation could influence diversification of both livelihood activities and crops grown by

[3] Fafchamps, 2003; Dercon, 2005 and Christiaensen, and Subbarao, 2005.
[4] Carter 1984; Ellis, 2005; Fan and Chan-Khang, 2005; Hazell et al., 2007 and Thapa 2007
[5] According to Carter per ha productivity was observed to decline by 20% as land under production doubled, and as regards inputs, small farms were less productive by 15% given the same inputs.
[6] This view is also held by Pol Barbier (1984) as cited by Mahesh (2000).
[7] Ellis, 2005: Fan and Chan-Khang , 2005 and Hazell et al., 2007
[8] Immink and Alarcón, 1992 and Block and Webb 2001

households. Generally, basic economic principles would suggest that farmers with larger farms would be more likely to diversify by moving out of agriculture (in case of activities requiring collateral) or even being able to adopt new crops. However, Immink and Alarcón, (1992) argue that small farmers are also capable of diversification by using their small pieces of land to practice crop diversification, hence spreading risk across different farm activities. On the other hand Ellis (2005) and Hazel et al. (2007) point out that small farms are good for poverty reduction as they are operated by typically poor people. Nevertheless, Ellis emphasizes that while seeking to raise yields and outputs in small-farm agriculture as a poverty reduction strategy in Africa, other alternatives need also to be considered: this measure is not sufficient on its own without acceleration of the rural-urban transitions. In addition Ellis highlights the worry that the persistence and ever deepening form of small holdings in Sub-Saharan Africa raises the question of their continued sustainability. Ellis cautions that as farm holdings get smaller and their orientation increases towards low level subsistence than was the case twenty or thirty years ago, much of rural Africa risks sliding into greater vulnerability. He points out that due to the decrease in farm sizes over the above period slight disturbances in the normal rhythm of the seasons have caused quite disproportionate food security crises to arise in some places, or more widely across zones and countries, threatening the well-being of the poor. A household's farm size and its fragmentation or consolidation into one unit could according to some literature[9] also influence crop production. For example while Wiggins (2009) argues there is a possibility of small farms succeeding in providing for a household's food and income needs, Collier (2008) argues small scale farms are not only unable to cope with innovations, quality and labour standards, but are also unable to react to changing market demands, making them unfit for poverty reduction strategies among rural dwellers.

Commercialization of agriculture is according to literature, an important strategy for improvement of rural households' well-being[10]. And according to Satyasai and Viswanathan, (1997) commercialisation at the farm level can take place in various ways: by growing of cash crops, change in the share of marketed output or change in the share of purchased inputs per unit of output. Spring (2000) and Hazel et al. (2007) argue that commercialisation of agriculture is the best way for households to ensure their food security and general well-being. It is thus expected that through adoption of improved technologies such as chemical fertilizers and improved seeds commercialized households will be able to raise their productivity both in terms of unit of land used (kg/ha), unit of labour and inputs used. Commercialization of agriculture in case of a shift from food crops to higher value crops would mean that households can earn enough cash income with which to purchase their food from the market, therefore relieving such households of the need to produce for their own consumption.

[9] Blarel et al., 1992; Ellis, 2005; Hazel et al., 2007: Collier, 2008 and Wiggins, 2009.
[10] IFAD, 2000 and WB, 2007.

Generally, literature on production constraints[11] identifies three classes of constraints facing farmers in their crop production, these can be grouped into three broad categories: farm related, household related and those related to location. Farm related constraints include small farm sizes, low soil fertility; poor technologies used in land preparation, high weed intensity and low access to agricultural extension services. Easy access to modern inputs such as chemical fertilizers, improved seeds and pesticides by farm households is an important ingredient for higher output and production per unit of labour and/or land. Govereh and Jayne (1999) argue that in order to improve rural incomes in Africa, some transformation of the continents current semi-subsistence, low-input, and low-productivity farming systems has to be achieved.

The importance of agricultural extension services in raising agricultural productivity of smallholder farmers cannot be overstated; evidence from literature shows that access to these services is paramount to increased crop yields. Generally, extension services aim at transferring specific knowledge to producers, such as the transfer of technology, the improvement of management practices or the transfer of knowledge and capacities (Cerdán-Infantes et al., 2008). In showing the importance of extension in raising agricultural productivity SAA (2007) argue that reliable extension services and the promotion of input use for example use of chemical fertilizers was able to raise small holder maize production in northern Tanzania. Kaliba et al., (2000) have also reported from their study on the intermediate and lowland zones of Tanzania that availability of extension services was one of the most important factors that influenced adoption of improved maize seeds and use of inorganic fertilizer in maize production.

Due to the importance of agriculture to rural households' well-being and the declines in agricultural productivity[12] that Tanzania faced in the late 1970's to early 1980's, the government liberalized both the agricultural input and output markets. According to Temu and Ashimogo (1998) the agricultural reforms mainly aimed at increasing Tanzania's agricultural productivity through improvement of market access for both inputs and outputs. According to some literature[13] the government's involvement in the marketing of both export and food crops, which started in the late 1960s and early 1970s, did not do much to help maintain the agricultural growth rates despite having success in production and purchase of food crops in remote areas of Tanzania (Putterman, 1995). However, Putterman points out that whereas the policy of uniform pricing meant villages and regions that were relatively remote from the main markets for their products found selling to the official channels attractive, the better situated villages and regions sought to evade legal controls and sell to private traders. Putterman also points out that the pan-territorial pricing of inputs such as chemical fertilizers and other inputs also meant that regions less well situated with respect

[11] Allen *et al.*, 1989; Sibuga et al., 1992; Bisanda et al., 1998; Govereh and Jayne, 1999; Graham et al. 2003; WB, 2000 as cited by Skarnstein, 2005; Hillocks et al., 2006; IRRI, 2007 and Mpagalile et al., 2008.
[12] Sarris and van der Brink 1993 cited by URT et al. 2000.
[13] Meertens (2000) and Cooksey(2003)

to the market were being favoured at the cost of those better situated, which in reality meant these were paying relatively more. However, during the period of state control access to inputs was linked to crop purchases whereby cooperative unions advanced these to farmers without paying and thereafter deducted territorially uniform input cost from the crop price at the time of purchase. Therefore, the market reforms mean inputs and output prices will vary in accordance to location and this could influence types of crops and how they are grown by households.

In summary, the thesis aims to examine rural farm households' livelihoods, crop production and well-being in the context of 20 years of agricultural reforms that led to among other things, the liberalization of the maize market. Specifically the thesis examines livelihood strategies, crop production and rural households' well-being in Rukwa, one of the country's agricultural power houses; it is normally known together with the regions of Mbeya, Iringa and Ruvuma collectively as 'the big four'. The thesis in examining crop production in Rukwa intends to put a greater emphasis on maize production, due to the fact that maize is the single most important food staple in sub-Saharan Africa (Byerlee and Heisey, 1996). In Tanzania it's the main staple and its production accounted for 72 per cent of the land planted with cereals in the 2002/03 cropping season involving 3,096,707 households on Mainland Tanzania (NBS et al., 2006). Apart from being a major source of household food, maize is also a major source of income to many households due to being a dual purpose crop[14].Therefore, examining maize in the above context will give us an understanding of its role in the livelihoods of rural households in Rukwa, a region known for its big maize harvests. The examination will also shed light as to what extent farm households have been able to commercialize their production in the context of the market reforms. Another motivation for the emphasis on maize production is that staples according to Hazel et al. (2007), are a powerful tool for reduction of rural poverty, especially when one considers small farms. The argument by Hazel et al. fits the Tanzanian situation whereby, as pointed out above the agricultural sector is mainly operated by smallholder farmers owning between 0.9 and 3.0 ha of farm land, of which 85 percent is allocated to food crops (NBS et al., 2006).

In order to achieve the above objectives the study uses both primary and secondary sources of data to shed light on crop production levels and trends. The study also uses fieldwork data to explore the role of maize in households' crop and livelihood diversification, households' commercialisation of crop production and households' well-being. Crop commercialization is examined through market participation of maize farmers by their sale of either maize or other crops they grow. Generally, the study considers both on-farm diversification and off-farm diversification by households. Lastly, the study uses a range of wellbeing indicators (as detailed in Chapter Three) to explore the relationships between maize, diversification and commercialisation.

[14] Ashimogo, 1997; Bisanda *et al.*, 1998; Kaliba *et al.*, 1998; Mafuru *et al.*, 1999 and Doss *et al.*, 2003.

1.2 Objectives of the Study

The main objective of the current study is to examine rural farm households' livelihoods, crop production and well-being after a period of trade reforms. In meeting the above, the study has addressed three specific objectives. The first was to examine how diversified the households were following liberalization of the agricultural sector, which included liberalization of the maize market in 1986. The study also aimed at establishing how important maize was to the LS, based on the fact that maize was the main staple for households not only in Rukwa but other parts of Tanzania too. Furthermore, as pointed out above many rural households in Tanzania including those in Rukwa depend on agriculture as their major source of livelihood and a substantial percentage rely on the sale of surplus food crops such as maize to earn cash income that is spent on other household needs. Many farm households in Sumbawanga and Nkansi districts in Rukwa earn a substantial amount of income by selling their surplus maize. The study seeks to determine how farm households were performing in the context of the reforms. A look at farm households' diversification of their livelihoods is also important due to the fact it would be expected that economic liberalization could lead into farm households specializing in areas where they have a competitive advantage. However, this prediction seems to contradict the fact pointed out by IFAD (2001), that it is normal for poor rural households to adopt diversified livelihoods as a way of both reducing risk and providing themselves with income in slack farming seasons.

The study's second main objective is to assess the nature of crop production among farm households. Specifically this aims at determining the productivity level, measured as yield per unit of land used (kg/ha) of important staples (i.e. maize, rice, and beans) and cash crops (i.e. tobacco, sunflower and groundnuts). Due to the importance of maize to many households in Tanzania the study will in particular assess how households have responded to the liberalization of the maize market in 1986. Therefore, one would expect removal of trading restrictions like pan-territorial input and output prices[15] and the movement of agricultural output beyond its area of production, put in place by the government following the adoption of Socialism in 1967, to motivate farmers to increase their productivity per unit of labour and land so as to have more surplus maize to sell and hence more income to use in improving their well-being.

The study's last specific objective is to examine Rukwa farm households' well-being after a long period of agricultural and other socio-economic reforms. Specifically the study assesses the households' ability to meet their education and health needs, ownership of a good quality house (see Chapter Seven) and the ability of the households to maintain social relations with family, friends and other community members through participation in social events like marriages, funerals and others requiring monetary contributions. As pointed out above many rural households in Tanzania including those in Rukwa depend on agriculture as their major source of livelihood and a substantial percentage rely on the sale of surplus food crops such

[15] Mwakalobo and Kashuliza, 1998; Ashimogo and Mbiha 2000 and Skarnstein, 2005.

as maize to earn income that is spent on other household needs. Many households in Sumbawanga and Nkansi in Rukwa earn a substantial amount of income by selling their surplus maize. Therefore, the study seeks to determine how farm households perceive their well-being in relation to the above and their overall performance with regard to assets owned (value).

The research, while focussing on a small number of hypotheses about farm size, diversification and commercialization and their links to well-being, aims to contribute to wider debates about agriculture and rural development more generally. First, it asks whether rural farm households can be lured into specialization, i.e. production of one crop or even to one livelihood strategy. This question is based on the argument that liberalization enables countries/firms to specialize their production in areas where they have a comparative or competitive advantage over other countries/firms as mentioned earlier. Based on the above it would therefore be right to assume that within countries farm households within certain regions/localities could also be attracted into specializing in those areas where they have a competitive advantage over others, and would be expected to get higher benefits (Kanji and Barrientos, 2002). It is further argued that specialization could lead to higher benefits, mainly because it helps in raising production efficiency levels through adoption of improved or modern technologies[16]. Investment in improved technologies particularly by individual firms or farm households may be impossible or limited in case production is diversified into different products, or crops in the case of agriculture. Specialization also enables one to make a thorough follow up on emerging technologies and marketing information for both inputs and outputs. All this, coupled with sound technical advice from professionals in the concerned area, can easily raise production efficiency of producers who specialize, compared to firms or farm households that are dealing with lots of products or crops at the same time. However, many firms and farm households in both the developed and developing world still diversify their income or livelihood sources despite the benefits predicted for specializing in areas where they may have a competitive advantage. The explanation of this may be the fact that diversification of livelihood strategies by individuals or farm households is the norm compared to specialization (Chambers, 1997 and Barret *et al.*, 2001).

Secondly, the thesis aims to explore the general expectation that open markets allow improved access to ideas and technologies (Kanji and Barrientos, 2002)[17]. As a result of this expectation firms and farm households in case of agriculture are expected to increase their production efficiency and raise productivity per unit of labour and/or land for agriculture. This expectation coupled with advice from international financial institutions has been a major factor convincing policy makers in developing countries, including those in Sub Saharan Africa, to agree to structural adjustment programmes and later economic reforms that led to liberalization of input and output markets. However, despite the firm expectations and

[16] Edwards (1998) as cited by Harrison and Hanson (1999), Evans, (2001), McCulloch et al., (2001) and Gisselquist and Harun-ar-Rashid as cited by Winters et al., (2002)

[17] Edwards, 1998; as cited by Harrison and Hanson, 1999; McCulloch et al., 2001 and Gisselquist and Harun-ar-Rashid as cited by Winters et al., 2002.

belief by both the supporters of open markets and policy makers in developing countries that input markets would work perfectly following the laws of supply and demand, the reforms have failed to deliver the intended results in relation to agricultural markets. For example due to reforms in the input markets, use of improved technologies, for example fertilizer use, has decreased in many sub-Saharan African countries[18]. Furthermore, due to the differences in infrastructure development, some remote areas either have limited access to inputs or have to pay higher prices than areas with better road networks and other means of transportation. As a consequence of this, less use of improved technologies could lead to lower yields and output, denying farm households much needed cash from sale of crops.

Lastly, the research explores whether liberalization of dual purpose crops such as maize, which is both a food crop and an income earner when surplus is sold, has the potential of enabling farm households involved in its production to reduce their poverty/improve their well-being. The motivation for this question is twofold. First, agriculture plays an important role in the livelihoods of many rural households in many developing countries. In Africa it remains the foundation of most economies, accounting for about 70 percent of full time employment, 33 percent of GDP and 40 percent of total export earnings (IFPRI, 2002). Despite the importance of agriculture to Africa most of the production is carried out by smallholder farmers, some of whom only produce on a semi-subsistence or subsistence level. Therefore, open markets with many buyers would be expected to assure farm households market for their produce, motivating them to increase efficiency through allocation of resources in areas where a firm or farm household has competitive advantage. Therefore, either these smallholder farmers would produce only the crops with the potential to earn the greatest income, or in so doing they would abandon lesser paying crops. Secondly, dual purpose crops like maize receive inadequate support from policy makers and politicians. For example in Tanzania production of maize is not promoted with the same vigour as other crops, particularly the 'traditional' cash crops: coffee, cotton, pyrethrum, tea, cashew nut, tobacco and sisal. As a consequence of this differential promotion many people do not value maize as a potential cash crop. In a recent regional tour of Dodoma, the president of Tanzania, His Excellency Jakaya Mrisho Kikwete, advised farmers to grow cash crops in addition to the food crops they grow, which according to him was the only way out of poverty (Issa, Alasiri Newspaper, 09/06/2008). In another tour in Tanga region the president also advised regional leaders to emphasize the importance of growing cash crops to their residents (George, Nipashe Newspaper, 24/7/2008).

1.3 Organization of the Study

The thesis is organized into eight chapters, including this introductory part which has given a brief overview of the role of staples production and diversification of livelihood strategies on well-being,

[18] (Kherallah et al. , 2000 and Crawford et al., 2003), seeds and chemical fertilizers declined among farmers in Malawi (Kherallah and Govindan, 1999), Kenya (Groote *et al.*, 2006 and Mose, 2007), and Tanzania (Matowo and Mgema,1990 as cited by Nkonya et al., 1998; Mafuru et al., 1999 and Doss et al., 2003; URT, 2008; Bissanda et al., 1998; Skarnstein, 2005).

motivation for conducting the study, its specific objectives and some hypotheses the thesis aims to explore. In Chapter Two the thesis mainly concentrates on the review and clarification of key concepts, and reviews literature on diversification of rural livelihoods, crop production and rural well-being. Chapter Three presents the research methodology used in the execution of the study, type of data used and reasons. The chapter also offers a description of the study area and limitations encountered in the execution of the study. Lastly, the chapter presents the socio-economic characteristics of the respondents.

Chapter Four offers an overview of Tanzania's agriculture, whereby a background on the changing context of the country's agriculture is explored by reviewing reforms undertaken in the sector since independence in 1961. The chapter also analyses trends in crop production of six selected crops using secondary data. Three food crops (maize, rice and beans) and three cash crops (groundnuts, sunflower and tobacco) will be examined. The emphasis on these crops is based on their popularity during the interviews and the FGDs as they were, according to the respondents and discussants, the most important crops in the area. Other crops grown in Rukwa include food crops such as finger millet, cassava, sweet potatoes and sorghum, and cash crops such as coffee and wheat (URT et al., 2004). However, the chapter will put a greater emphasis on maize production due to its socio-economic importance to households in Rukwa, as already mentioned. Therefore, the chapter will examine Tanzania's maize production before and after the maize market was liberalized in 1986. The chapter mainly takes a historical perspective on maize production in Tanzania, maize production levels and trends before and after the liberalization of the maize market, and factors affecting production of the crop. The examination aims at offering a thorough understanding of how the sector has been performing in the two periods.

Chapter Five examines the nature of both on farm and off-farm diversification among farm households. The examination aims at establishing how important staples (i.e. maize) are to the LS, and how livelihood strategies vary across key farm and household characteristics. The characteristics to be examined include household head's, age, gender, education, farm size and fragmentation and location.

In Chapter Six the thesis examines production of six crops; three food crops (maize, rice and beans) and three cash crops (groundnuts, sunflower and tobacco) whereby their output (total kilograms produced) and productivity (kg/ha) will be determined. However, a major emphasis will be put on maize due to this crop's importance both at the regional and national levels. As regards maize, the chapter analyses in detail the surveyed households' maize production by first examining farmers' own views about the importance of maize and the levels of maize production recorded in 2005. Secondly, the chapter examines constraints facing maize farmers in Rukwa. Lastly, it conducts some regression analysis aimed at assessing how important individual constraints are and to shed light on some of the factors related to farm output and crop productivity debates, for example farm size. Generally, the chapter also aims to gain an insight into whether maize production still commands a dominant role in the surveyed households' welfare.

In Chapter Seven the thesis examines and discusses the surveyed households' well-being. The chapter aims to understand the level of well-being among rural households in Rukwa; the relationship between agricultural production, in particular the contribution of maize and other crops to household income and assets, and the households' ability to pay for key services such as health and education. The level of well-being among households will mainly focus on maize production, based on percentage of land allocated to maize farming, the percentage contribution of income from maize sales to household income in 2005 and the households' general sale of crops. The chapter will also examine opinions by respondents as to whether maize production could be relied upon as an escape route out of poverty. Lastly, Chapter Eight provides a summary, major conclusions and some broad policy recommendations as well as suggested areas needing further research.

Chapter two

Literature review

2.0 Introduction

This chapter starts by offering some definitions and conceptualizations of terminologies. An exact understanding of these terminologies is important in explaining the livelihoods, crop production and well-being of rural households in Rukwa in the context of 20 years of agricultural reforms that included the liberalization of the maize market in 1986. The fact that different authors define the terminologies differently makes it necessary that the defining of key words be made. The chapter also reviews literature on diversification of rural livelihoods and crop production. The literature reviewed mainly aims at getting some theoretical and empirical evidence of why households diversify their livelihood strategies (LS) and crop production in Sub-Saharan Africa. In brief the review will mainly aim at identifying farm households' diversification of their on-farm and off-farm activities, and how these are related to a household's well-being. The review also aims at understanding crop production in Sub-Saharan Africa and its constraints.

The chapter concludes that many rural households diversify their livelihood strategies in pursuit of a better living or as a means of survival. The chapter also concludes that crop production in Sub-Saharan Africa both in terms of yield and crop mixes lags behind that of other regions and that farm households face various constraints in crop production, which include declining farm sizes, limited access to improved technologies due to either unavailability or lack of financial capacity, unreliable weather, crop diseases and pests, poor access to agricultural extension services, poor access to markets due to inadequate transport infrastructure, and services in rural areas.

2.1 Conceptualization of key terminologies

This section defines or/and conceptualizes the key terminologies at the heart of the current study: rural areas; well-being; livelihoods and livelihood diversification; and trade liberalization. Getting together the different perspectives/conceptualizations is of importance particularly in giving explanations of the success or failure to improve the well-being of the surveyed farm households after many years of agricultural reforms and particularly the liberalization in the maize market. However some concepts, for example the definition of income and assets, are provided in Chapter Three, which deals with the study's methodology, some of the variables used are defined or elaborated; crop productivity and how to measure it is examined in Chapter Six and how to measure well-being is picked up in Chapter Seven.

2.1.1 What are rural areas?

Definition of rural areas varies depending on who is defining them and specific country situations. Its meaning differs significantly between developed countries, countries in transition and those in the

developing world. The current study will mainly be based on a definition by the Tanzanian government, whose Rural Development Strategy (RDS) sees rural areas as "those including villages and small towns nearby urban centres" (URT/PMO, 2001:1). Other definitions have included other qualitative and quantitative characteristics. For example SARDF (1997:9) see rural areas as those with sparse populations who are dependent on natural resources, USDA (2005) describe them as areas comprising of open country and settlements with fewer than 2,500 residents; whereas Nwanze (2000) defines them as having population thresholds of between 5,000 to 10,000, who are primarily dependent on agriculture and/or natural resources for their livelihoods.

As compared to urban areas, rural areas are inhabited by people owning more 'rural-specific' assets such as farmland, livestock, and irrigation per person than urban people (IFAD, 2001). Conway cited by Ashley and Maxwell (2001) points out additionally, that rural people are poor and isolated in every sense, and have few opportunities for off-farm employment, with labour demand being seasonal and insecure. Extension services are few and far apart and research on their specific needs is sparse too. The conditions of rural people can profoundly affect agricultural production and productivity, denying them opportunities to reduce their poverty or improve their living conditions.

Generally, individuals and governments define rural areas differently. However, major characteristics shared by the definitions include remoteness, low population densities and high dependence on agriculture and/or natural resources for livelihoods. Due to these characteristics people living in rural areas, particularly those in developing countries such as Tanzania, tend to own fewer human and physical assets.

2.1.4 What are livelihoods?

Defining the concept of livelihood is essential in order to develop understanding in discussions and conclusions to be reached in the empirical chapters of the thesis, specifically Chapter Five on rural livelihood strategies associated with well-being in Rukwa. According to Ellis (2000) livelihood as a concept has been widely used in contemporary writings on poverty and rural development. However, it has been defined differently by different observers. According to Ellis "A livelihood is defined as the assets, the activities and the access that determine the living gained by the individual or household" (p 22). Many other authors have tried to define the concept. Chambers and Conway (1992) cited by Ahmed and Lipton (1997:6) define livelihood as ".the ways in which people satisfy their needs or gain a living". According to Ahmed and Lipton a livelihood should be seen as "a set of flows of income, from hired employment, self-employment, remittances or (usually in developing rural areas) from a seasonally and annually variable combination of all these". They further stress that a livelihood should be able to assist those involved to avoid poverty, and preferably, increase well-being of the concerned person and his/her dependents.

Looking at the various ways in which livelihood has been conceptualized confirms Ellis' observation on the vagueness of the concept. Nonetheless, for more meaningful research work, especially that which involves the rural people's way of living, one needs to clearly state what a livelihood means in the particular setting, bearing in mind also the vagueness of the word rural as earlier explained (section 2.1.1). Hann and Zoomers (2005) have emphasized the importance of looking at livelihoods in a much broader way. They argue that a better understanding of livelihoods in a holistic way is critical in addressing poverty and the general livelihoods approach. In the writers' view a better understanding of both livelihoods and rural areas is important, as different people with different views of the concepts may find relevance in the findings of particular studies on rural livelihoods.

2.1.2 What is well-being?

Defining well-being is not an easy task (Pollard and Lee, 2003 and Galloway, 2006). For example Pollard and Lee argue that to define well-being is difficult due to it being complex and multi-faceted in construct and that therefore the possibility of getting a clear-cut definition and way to measure it has continued to elude researchers. Galloway (2006) argues that there is inconsistency in defining well-being even within individual disciplines, to the extent that producing a comprehensive overview of definitions in use within the literature is a formidable task. According to Honderich (2005) as cited by Glough et al., (2008) even the new edition of the usually concise and parsimonious *Oxford Companion to Philosophy* only defines well-being abstractly as "living and faring well" or "flourishing". On the other hand, the Research Group on Well-being in Developing Countries (WeD) defines well-being as "a state of being with others, where human needs are met, where one can act meaningfully to pursue one's goals, and where one enjoys a satisfactory quality of life."(WeD, 2008:1)[19]. A detailed conceptualization of well-being and how to measure it is presented Chapter Seven.

2.2 Literature review on diversification of rural livelihoods

This thesis in this section reviews literature on diversification of rural livelihoods, and starts off in sub-section 2.2.1 by examining how diversified rural livelihoods are; in sub-section 2.2.2 it examines the strategies rural households adopt in their endeavor to diversify their livelihoods. Lastly in sub-section 2.2.3 the thesis examines limitations facing rural households in relation to diversification of their livelihood strategies. Understanding the above will aid in better understanding of study observations on Rukwa households' diversification of their livelihoods and its role in their well-being, as covered in Chapters Five and Seven respectively.

[19] More on well-being and how the study plans to use it is presented in section 7.1.

2.2.1 Diversification of rural livelihoods

This section examines definitions of the diversification of rural livelihoods, an understanding of which is especially relevant to Chapter Seven, which examines the well-being of rural households in Rukwa. Some definitions of diversification of livelihoods observe that rural households not only practice farming, but engage in an array of other ways to earn their living. Carswell (2002) argues that despite the contribution made by diversification of rural livelihoods, policy makers seem to only focus on agriculture. Ellis (2000:14) has tried to show a clear distinction between the words 'diversity' and diversification when the two are referred to livelihoods[20]. However, the terms are mainly used to mean multiple and multiplying income sources. Ellis defines livelihood diversification as" a process by which rural households construct an increasingly diverse portfolio of activities and assets in order to improve their standards of living" (2000:15). In their publications, Ellis (1998) and Carswell (2000:4) have used a modified version of diversification of rural livelihoods, which uses social support capabilities as an important measure of assisting rural people improve their living standards. Other authors writing on diversification have in principal worked in agreement with the definition of diversification of rural livelihoods or deviated from it by including other terms in their definitions. Ellis (1998) points out that even though he refers to rural livelihood diversification it doesn't mean there is no livelihood diversification in urban areas; citing various literatures[21] he shows that livelihood diversification isn't only a rural phenomenon for developing countries but also a survival strategy of urban dwellers in developing countries[22].

Other literature dealing with income diversification[23] in relation to rural households appears to be implicitly addressing rural livelihood diversification. A closer examination of their definitions shows income to be included implicitly or explicitly. They also mention welfare or making a living. Some of the literature[24] addressing income diversification appears to argue that individuals either in urban or rural areas diversify their income sources as a way of diversifying their livelihoods, or as an insurance against threats to their living standard. However, Ersado (1997) cautions against using 'income diversification' synonymously with 'livelihood diversification'. Others[25] as cited by Ellis (1998) agree with Ersado (1997) that income diversification should be looked at differently from livelihood diversification. Their main argument is that a livelihood is more than just income: it includes both income (as cash or in kind) and the social institutions, gender relations, property rights and their interconnected roles in improving living standards. Many[26] argue that a livelihood may also include ones access to the public and social benefits provided by the state.

---

[20] Ellis defines diversity as "the existence, at a point in time, of many different income sources, thus also typically requiring diverse social relations to underpin them". p 14

[21] Barker and Pederson (1992); Rakodi, (1995) de Haan, (1997) and Moser, (1998)

[22] This can be seen to fit conceptualization of a livelihood which includes a broad array of sources of income as the definition by Ahmed and Lipton (1997).

[23] Barrett, Bezuneh and Aboud, 2001; Ersado, 2003; Escobal, 2001; and Deacon and Krishnan, 1996.

[24] Ersado, 2003; Barret et al., 2001 and Deacon and Krishnan, 1996.

[25] Reardon et al., (1992); Adams and He (1992); Berry, (1989; 1993: Ch 7); Hart, (1995) and Bryceson (1996)

[26] Lipton and Van der Gaag, 1993 and Blackwood and Lynch, 1994 as cited by Ellis, 1998

Analysis of livelihoods and diversification may be difficult depending on how one conceptualizes the livelihood. For example Bryceson (2002) talks of 'multiple livelihood' in contrast to the DfID's 'multiple livelihoods approach'. Bryceson criticizes DfID's approach to rural livelihoods analysis by pointing out that the framework proposed tries to combine social and economic analysis and defines 'livelihood outcomes' in normative economic development terms. She argues that the framework overemphasizes the social and distances the political dynamics, ignoring how rural agents actively shape the non-economic processes of change in their areas. Chambers and Conway (1991:6) insist on the inclusion of 'capabilities', 'equity' and 'sustainability' in the conceptualization of sustainable livelihoods.

In contrast to Chamber and Conway's view, Ellis, (2000) citing Longhurst (1994) cautions that much writing on livelihoods in the developing world uses concepts such as Sen's 'capability' or others such as entitlement, which complicate rather than simplify the livelihoods analysis. Ellis considers it better that both 'capability' and 'entitlement' should be distinguished from livelihood analysis for the better of the approach. A clearer understanding of rural livelihoods diversification can be achieved by breaking down the various activities of the rural households based on their core activities, either on an individual or group basis or on whether movement away from the home-base is involved (Toulmine *et al.*, 2000). Bryceson (2002) in the 'multiplex livelihoods' approach, stresses the complexity and multidimensionality of ways by which different forms of work, means of earning income and variety of activities are at the disposal of rural people for their living.

The importance of diversification of rural livelihoods is given weight by the fact that various researches have dealt with this area, describing a range of reasons why people in rural and as well as urban areas diversify. Reasons provided in this section will answer some of the questions that may arise in Chapter Five, concerning rural livelihoods strategies associated with well-being in Rukwa region. Chambers (1997) argues that the livelihoods of most poor people are more diverse and complex than professionals think, and that most people in the South (developing countries) and many in the North (developed countries) earn their livelihoods from a diverse array of activities. Barret *et al.*, (2001:1) state,

> Diversification is a norm. Very few people collect all their income from any one source, hold all their wealth in the form of any single asset or use their assets in just one activity. Multiple motives prompt households and individuals to diversify assets, incomes and activities.

According to Barret *et al.*, the major motives that push people into diversifying are 'push factors', which include risk reduction, responding to various constraints such as land fragmentation, and labour supply issues. The second major motive includes 'pull factors', which include involvement in complementary activities and specialization based on comparative advantage (Barret *et al.*, 2001). Hart (1998) as cited by Ellis (1998) groups the motives into two major typologies. The first is the branch of literature predominantly concerned with diversification as a matter of survival, and the other sees diversification as a matter of choice and opportunity whereby households strive to improve their living standards. Ellis (1998: 8) sees diversification as being caused by a continuation of motivations, which are variable across families and

time, and causes, which may in turn be location or disaster specific. Winters *et al.* (2001) in their review of literature of Latin America and the Caribbean, point out that diversification can occur as a result of the low profitability of agriculture and the withdrawal of the government from programmes. Bryceson (2002) sees income diversification as a sub-set of livelihood diversification and argues that income diversification in many areas of rural Africa is happening as a way of meeting individual needs in response to low returns from commercial agriculture. Ponte (2001) also acknowledges the role of market liberalization in encouraging increased diversification.

Diversification of rural households' livelihood strategies is driven by many factors. They include low profitability of agriculture or the need for a way of meeting individual needs caused by low returns from commercial agriculture, and the withdrawal of the government from support programmes, risk reduction, responding to various constraints such as land fragmentation and labour supply issues. The rural household is involved in complementary activities and specializations depending on comparative advantage.

2.2.2 Rural livelihood diversification strategies

This sub-section looks at the strategies rural households adopt in their endeavour to diversify their livelihoods. An understanding of these strategies is particularly important to the current study, especially the analysis of the field data concerning households' diversification of livelihood strategies (LS) and their well-being. Ellis (2000:40) defines a LS as "to compose activities that generate the means of a household's survival". According to Ellis a household's choice of a particular livelihood strategy depends on many factors, which may include social influences, exogenous trends or shocks. Individuals in rural areas diversify by involving themselves in trade, migration, and artisan activities. Migration in this case could either be to work as agricultural labour, or to work as domestic workers (women) or urban labourers (men) (Carswell, 2000). According to Ellis (2000), work adapted from Scones (1998) and Carney (1998), rural livelihood strategies can be placed under two categories: the first including strategies based on natural resources and the second the non-natural-based activities (see Table 2.1).

Rural producers may diversify by changing the composition of what they produce, for example by increasing the number of crops or changing to crop and livestock production (Hussein and Nelson, 1998). This is seen as the starting point for poorly resourced farmers, who may be short of capital or lack other means of income generation. Hussein and Nelson also point out that sale of waged labour and self-employment on small firms could be another strategy available to rural farmers. Other ways by which rural people diversify include movement away from agricultural work (Bryceson, 2002; Barret, et al., 2001), movement from unpaid work to paid work and from household-based to more individualized labour activities (Bryceson, 2002), and diversification into higher value crops and seasonal migration (Thann *et al.*, 2005). Deacon and Krishnan (1996) point out that income of peasant households in developing

countries comes from an array of sources including farming both cash crops for sale and crops for subsistence. Households can also engage in making of local crafts, in trade, hiring out of their labour and livestock keeping. This finding supports what has been reported by the other authors above. According to Scones (1998:3), livelihood diversification may include agricultural intensification or extensification, livelihood diversification, migration or a combination of these.

Table 2.1: Categories of rural livelihood strategies

Livelihood Strategy	Characteristics
Natural resources based	-Collection and cultivation of food -Cultivation of non-food -Livestock keeping -Collection of firewood and forest products
Non-natural resources based	-Rural trade -Other services -Rural manufacture -Remittances -Other transfers

NB: The above table is based on work by Scones (1998) and Carney (1998), as adapted by Ellis 2000

2.2.3 Limitations on diversification of livelihood strategies

Examination of factors that could limit diversification of rural livelihoods could aid the understanding of why some of the surveyed households reported in Chapter Five were not diversifying or were diversifying at a low intensity. Diversification of livelihoods can be constrained by many factors. Among these is gender; for example Scones (1998) points out that livelihood diversification strategy tends to be gender specific, and this is supported by studies done in Gujarat, India and in Bangladesh by Chen (1989) and Kabeer (1990) respectively, as cited by Scones. The studies show that men and women have different access to diversification strategies based on cultural, practical or ideological constraints. Another factor is market access, whose absence can discourage diversification[27]. Barret et al. (2001) also point out factors such as non-farm income share of households, and lack of skills and education which could influence diversification of LS. Extreme poverty is another factor that can limit livelihood diversification; extremely poor individuals seem unable to engage in livelihood diversification activities due to their lack of means (Smith *et al.*, 2001).

In summary, diversification of rural livelihoods strategies can be constrained by many factors, including one or a combination of the following: gender culture; practical or ideological constraints; absence of markets; non-farm income share of households; and lack of skills and education. Others are lack of physical access to markets, and extreme poverty.

[27] Barrett, et al., (2001) and Carswell, 2000.

2.3 Crop production in Sub-Saharan Africa

The performance of the agricultural sector in Sub-Saharan Africa (SSA) has been unsatisfactory for the past several decades[28]. Kydd et al. (2004) point out that SSA reported rate of growth in agricultural production over the last 30 years has been lower than those of other regions. They add that whereas SSA experienced some very low rates of growth in the 1970s, followed by increases in the 1980s and 1990s, nonetheless per capita growth has been very low or negative over much of the period, and only in SSA has agriculture been growing at a rate below overall population growth from 1965 to 1998, and at a lower rate than growth in the agricultural labour force from 1980 to 1998. Whereas other areas have been able to reduce the area under cultivation of cereals, in SSA instead of increasing production of cereals through intensification, most countries in the region have done so by expanding the area grown at the expense of other crops. In other regions, the area under cereals has either declined or increased only slightly. According to the World Bank, (2000) and FAO (2000) cited by Kydd et al. in SSA nevertheless more than 70% of increased cereal production is from expansion of area under production and countries have been unable to increase their yields, other regions have achieved 80% or more of their increased cereal production from yield increases. According to some literature[29] countries in SSA need to embark on the process of "sustainable intensification" to avoid continued "soil mining" and extension of cultivation on to increasingly fragile and vulnerable land. "Sustainable intensification" requires increased use of purchased inputs, especially seeds and inorganic fertilizers in order to supplement low external input of organic sources of plant nutrients.

2.3.1 Factors affecting crop production in Sub-Saharan Africa

Generally, literature identifies three classes of constraints facing farmers in their crop production. These constraints can be grouped into three broad categories: farm related, household related and those related to location. Farm related constraints include small farm sizes, low soil fertility; poor technologies used in land preparation, high weed intensity and low access to agricultural extension services. A household's farm size and its fragmentation or consolidation into one unit could, according to some writers[30] and as shown in Chapter One, influence a household's crop production.

Farm operations are also constrained by the use of poor technologies such as land preparation using the hand hoe (URT et al., 2007). The use of the hand hoe in land preparation is still very popular in many areas of SSA. FAO (2006) argues that the use of draught animals for example oxen, while enabling saving of labour could also reduce drudgery and save time by up to between 5 - 20 times compared to using only manual labour. Use of draught power could also allow expansion of cultivated area which could then lead to either higher volumes of one crop or higher yields due to timely operations especially planting and

---

[28] Larson and Frisrold 1996 and Kydd et al., 2004.
[29] World Bank, 1997; Reardon, 1998a and Reardon *et al.*, 1999 cited by Kydd et al., (2004)
[30] Blarel et al., 1992; Collier, 2008 and Wiggins, 2009.

sowing of seeds[31]. According to Govereh and Jayne (1999) animal traction has been shown to have a significant and positive effect on food crop productivity in Zimbabwe. They also argue that under land-abundant conditions, animal traction allows households to put more land under cultivation, allowing increased farm production per capita.

Easy access to modern inputs such as chemical fertilizers, improved seeds and pesticides by farm households is an important ingredient in higher output and production per unit of labour and or land. Low soil fertility as a challenge to crop production has been reported by many[32]. For example Govereh and Jayne (1999) argue that in order to improve rural incomes in Africa, some transformation of the continent's current semi-subsistence, low-input, and low-productivity farming systems has to be achieved.

As shown in Chapter One access to agricultural extension is important for raising agricultural productivity of smallholder farmers. Several writers[33] show that access to these services is paramount for increased crop yields. Generally, extension services aim at transferring specific knowledge to producers, such as technology, the improvement of management practices or knowledge and capacities (Cerdán-Infantes et al., 2008). In showing the importance of extension in raising agricultural productivity SAA argue that reliable extension services and the promotion of input use, for example use of chemical fertilizers in the Sg 2000 project implemented in the northern parts of Tanzania, led to a rise in smallholders' maize yields to between 4.5 and 5.1 tonnes/ha, compared to the national average yield of around 1.3 tonnes/ha. Kaliba et al., have also reported from their study on the intermediate and lowland zones of Tanzania that availability of extension services was one of the most important factors that influenced adoption of improved maize seeds and use of inorganic fertilizer in maize production[34].

As well as farm characteristics other household socio-economic factors such as householders' age, education levels, gender, household size, number of livelihoods adopted and income could influence a household's crop output and yield. Education levels of household heads could be very important in making decisions related to production of general commodities and agricultural products. For example Pender and Gebremedhin (2007) argue that households with more education or other forms of human capital stand a

---

[31] Tenywa et al. (2000) argue that most smallholder farmers using hand hoes and ox-drawn ploughs fail to prepare their farms in advance of the onset of the rainy season due to hard soil conditions, limiting the amount of land that can be prepared, which may then lead to reduced total production. According to Siacinji-Musiwa (1999) smallholders practicing conventional tillage methods face high risks of planting their maize late due to the hardness of the ground and need to wait for the rains before ploughing. As a consequence each day of delay after the onset of the first planting rains leads to farmers losing up to 1.3% of their yield no matter how effective the subsequent husbandry practices are. Farmers delaying planting for 18 days may lose 25% of their production.

[32] Bisanda et al., 1998; Govereh and Jayne, 1999; Kydd et al., 2004 and WB, 2000 as cited by Skarnstein, 2005.

[33] Kaliba et al., 2000; Gemanda et al. 2001; Owen et al., 2003; SAA, 2007 and WB, 2007 :a.

[34] Owen et al., have reported from Zimbabwe that access to agricultural extension services at a level of one or two visits per agricultural year led to a rise in farmers crop productivity of 15 percent on average, other factors remaining constant. According to Gemanda et al., (2001) research conducted in Ethiopia has shown that agricultural extension services were among the major factors determining farmers' land allocation to maize production, the others are farmer's education, off-farm income, and livestock units owned.

better chance of accessing non-farm income and/or credit and thus could be more able to purchase inputs. They point out that such households may also be more aware of the benefits of modern technologies and more efficient in their farming practices. The influence of age on crop production has been reported by many as pointed out in Chapter Five (section 5.0). For example Govereh and Jayne (1999) have reported from their Zimbabwean case study that maturity of a household's head significantly and positively affected food crop productivity, presumably due to greater experience.

The influence of gender on agricultural productivity of households is well documented (Pender and Gebremedhin, 2007), for example citing Bauer, (1977) and Abay et al. (2001), they point out that female-headed households in Tigray (Ethiopia) used significantly less labour and draft power, probably due to labour constraints and a cultural taboo against women. The two also show from their study that female-headed households achieved 34% and 39 % lower crop output and lower yields respectively relative to male-headed households. Similar observations are quite prevalent in many parts of Tanzania whereby some activities like ox-ploughing are only done by men (Chapter Five: section 5.0). Despite efforts by the Tanzanian government to assure equal access to land between men and women, access and control by the latter is still poor. Lower agricultural productivity levels among households headed by a woman have also been reported in Ecuador (Larson and Leo´n, 2006).

Generally, it is expected that large sized rural households would be more able to easily supply the labour required for their crop production, basically due to abundance of their own labour. Pender and Gebremedhin (2007) point out that household size is normally seen as equivalent to family labour endowment, and despite the lack of a significant impact of family size on crop production, their Ethiopian case study showed the two to be positively related. Pender and Gebremedhin also argue that in instances where hired labour is costly to monitor, households with a greater endowment of labour are not only better placed to farm their land more intensively but also to conduct critical operations at the right time compared with households dependent on hired labour or short of labour, therefore larger households had the possibility of obtaining higher yields.

In addition to farm and household characteristics location can be a constraint to crop production, and matters could be made worse by a poor road infrastructure. Location of an enterprise or farm can determine types and amount of crops produced by farm households. The geographical influence on crop productivity has also been pointed out by Majid (2004), who argues that its influence on crop productivity is just as important as of institutional, political and other macro-economic variables. Furthermore, limited access to markets and roads has been found to reduce adoption of fertilizer and some other inputs and hence affecting crop productivity on regional basis in Uganda (Nkonya et al., 2005). The last observation is also supported by the 2008 World Development Report (World Bank, 2007)) which points out that inadequate transport infrastructure and services in rural areas particularly in Africa where less than 50 %

of rural dwellers live close to an all-season road are responsible for pushing up marketing costs hence undermining local markets and exports[35]. Other constraints to crop production include, diseases and pests and that of climate/weather[36].

The literature review so far has highlighted a number of factors that may be associated with crop production in Sub-Saharan Africa and the constraints farmers face. These include, declining farm size, limited access to improved technologies due to either unavailability or lack of financial capacity, poor access to agricultural extension services, poor access to markets due to inadequate transport infrastructure and services in rural areas.

2.4 Conclusions

The chapter has tried to define some of the key concepts of the study, namely rural areas, livelihoods and well-being. The chapter has also reviewed some literature on diversification of rural livelihoods, types of strategies adopted and limitations rural households face in their bid to diversify their livelihoods. Lastly, the chapter reviewed crop production in Sub-Saharan Africa and constraints faced by producers. To conclude, the literature has shown that many rural households diversify their livelihood strategies in pursuit of a better living or as a means of survival. The difficulties encountered in the analysis of diversification of livelihood strategies are mainly due to the lack of a simple definition accepted by all. A general observation is that many rural households diversify their livelihood strategies in ways that include diversifying their income sources, accessing public and social benefits provided by the state, and at times in kind payments; all diversification is used as a form of insurance against threats to their living standard.

The chapter also concludes that crop production in Sub-Saharan Africa, both in terms of yield and crop mixes lags behind that of other regions and that farm households in the region are more reliant upon traditional agricultural methods and therefore, use of modern technologies such as chemical fertilizers is limited, leading to low crop productivity both in terms of yield per unit of land used (kg/ha) and per unit of labour. It can also be concluded from the chapter that farm households in Africa face various constraints in crop production; these include declining farm sizes, limited access to improved technologies due to either unavailability or lack of financial capacity, poor access to agricultural extension services, poor access to markets due to inadequate transport infrastructure and services in rural areas. These observations indicate that something needs to be done urgently to raise crop productivity especially that of staples upon which most rural households in Sub- Saharan Africa rely for their livelihood.

---

[35] The 2008 WDR also argues that poor markets have a huge implication on food staples markets and that better markets could lead to agricultural growth as while raising farm gate prices they also build farmers confidence which then allows them to diversify into higher value crops.

[36] Bisanda *et al.* (1998), and SAA 2007[36]; Mduruma *et al.* 1998[36]; USAID- Tanzania (2005) and MACF (2007)

Chapter Three

Research Methodology

3.0 Introduction

This chapter presents a description of the study area, the research design, types of data and methods used in data collection and limitations to the current study. The chapter also presents the socio-economic characteristics of the respondents. It uses maps and tables in presenting the information whenever possible, and offers brief conclusions on research methodology.

3.1 Description of the study area

This section includes a description of Rukwa, the study's area of interest, an understanding of the study area with regards to its physical, geographical and socio-economic strengths and limitations that may in one way or other influence rural households LS, crop production and well-being in the context of 20 years of agricultural reforms.

3.1.1 Geographic location

Rukwa is found in the south-western part of Tanzania on the shores of Lake Tanganyika (Figure 3.1). The region lies between latitudes 3° and 9° south of the equator and between longitudes 30° and 33° east of Greenwich (URT et al., 2004). Rukwa is bordered to the North by Kigoma and Tabora regions, to the East by Mbeya region, to the South by Zambia and to the West by Lake Tanganyika, which lies between the region and the Democratic Republic of Congo (DRC) (Figure 3.0 & 3.1). Rukwa is situated on the Central African Plateau and is bordered by the Western arm of the Great Rift Valley. Access to Rukwa region is a bit restricted when compared to the other three regions bordering it; as it lacks good all-weather roads. Whereas Mbeya to the South is connected by a tarmac road to Dar es Salaam, a major maize consumption centre, the road connecting Rukwa to Mbeya is unpaved, causing some inconvenience during the rainy seasons, particularly due to irregular or insufficient maintenance. Kigoma and Tabora on the other hand are linked to Dar es Salaam by the Central rail line, which connects Dar es Salaam and Mwanza on Lake Victoria and Kigoma on Lake Tanganyika. Although there is a connection by rail between the Kigoma and Tabora rail line and Mpanda, the other parts of Rukwa, namely Sumbawanga and Nkansi lack this access and the only connection between Sumbawanga and Mpanda is a quite challenging 240 Km unpaved road whose passage is restricted during the rainy season.

3.1.2 Rukwa's administrative units

Rukwa is Tanzania's third largest region after Tabora and Morogoro (URT et al., 2004). The region has a total surface area of 75,240 sq kms of which 68,635 sq kms are land and 6,605sq water surfaces. Rukwa is divided into four administrative units; Sumbawanga urban, Sumbawanga rural, Nkansi, and Mpanda

(Figure 3.1). According to URT et al. (2004) whereas Mpanda district occupies about two thirds of the region Nkansi district, which borders Lake Tanganyika, accounts for 60% of the region's water area. Sumbawanga Municipal Council, the region's administrative and business centre is located within Sumbawanga urban administrative area.

3.1.3 Rukwa's socio-economic characteristics

In 2002 Rukwa had a population of 1,141,743 of which 559,120 were male and 582,623 were female. The population distribution by the above mentioned administrative units was, 412,683 Mpanda district, 373,080 Sumbawanga rural, 147,483 Sumbawanga urban and 208,497 Nkansi district. The region had a total of 222,868 households and an average household size of 5.1 in 2002 (URT, 2002). According to the 2002 census the region had an integrated population growth rate of 3.6 % between 1988 and 2002, relatively higher than the 2.9% reported for Tanzania mainland during the same period.

Rukwa is home to a number of ethnic groups who have settled there at different times. According to URT et al. (2004) permanent settlement is thought to have first occurred in 1,700 AD by people from what is now northern Zambia and Eastern DRC; this is supported by the existence of strong cultural ties between the Wafipa, Rukwa's dominant indigenous group, and people in those areas. Other less dominant indigenous groups include the Wakunde, Wanyamalingo, Wapimbwe, Wanyika and Walungwe. In recent times there has also been an influx of Wasukuma immigrants from Shinyanga and Mwanza regions as they move South in search of both cropping and grazing land for their Zebu cattle. The region also has some long horned cattle that were introduced from Burundi in around 1750 AD. Since the 1960s Rukwa has long been offering refuge in camps to refugees from Burundi and recently from DRC. Some major refugee settlements include the Katumba and Mishamo settlements.

Agriculture is Rukwa's economic backbone and 90% of the region's economically active population is engaged in agriculture, which accounts for about 65% of the region's GDP (URT et al.). Major crops grown by households in Rukwa include maize, finger millet, beans and rice, which are mainly for food, and tobacco, sunflower, groundnuts, coffee and wheat, which are cash crops. However, most of the region's cash income comes from maize, which accounts for 35% of the region's total annual food production (URT et al.). Proceeds from livestock production, which contributes about 20% of the region's economy, makes livestock keeping the second largest contributor to the region's economy (URT et al.). Fishing is another major source of employment, particularly to those living along the shores of Lake Tanganyika and Rukwa. However, URT et al. point out that even though the sector generates relatively good incomes through trade within the region and with neighbouring countries including Zambia, its importance is nevertheless small compared to crop and livestock production. Rukwa's industrial development is still in its infancy and is mainly concentrated in artisanal activities, whose share in the region's economy appears insignificant. Other livelihood sectors include those concerned with natural resources, mainly forestry and beekeeping.

The region also has the Katavi National Park; however due to the concentration of tourism in the northern areas of Tanzania (Arusha and Kilimanjaro) the contribution of Katavi to Rukwa's economy is limited, partly due infrastructure limitations (hotels and transport) and insufficient advertisement (URT et al., 2004).

Rukwa faces major challenges with regards to living standards of her households. Many households live in sub-standard dwellings, many live far from banks, literacy levels are low for both men and women and less than half have access to safe water sources (NBS, 2002: Household and Budget Survey (HBS) of 2000/01). While primary schools are reasonably close to households, secondary schools are not. Rukwa region in 2000/01 had the lowest mean monthly consumption of all the 20 regions of mainland Tanzania; the region had the lowest rural per capita household monthly income and the lowest rural median per capita income. According to NBS et al. (2006) households in Rukwa on average own about three hectares of which two, or two-thirds is normally utilized for crop production. The HBS results further showed that the region had about one in ten inhabitants below the food poverty line and about one in three below the basic needs poverty line. Only seven other regions in Tanzania reported a level below that of Rukwa. Only 3% of households in rural Rukwa had dwellings with modern floor (cement, tiles for their first building) as compared to 55% of those in urban Rukwa. Moreover, only 8% had modern roofs (metal sheets, tiles, concrete cement and asbestos sheets) compared with 64% in urban Rukwa.

3.1.4 Agro-ecological characteristics

Rukwa region is found in the uni-modal rainfall areas (Central, Western, South-Western, Southern and South-Eastern coast regions) of Tanzania, and receives rain from November/December up to April/May. The average temperatures range between 10^0c and 20^0c during the cold and hot seasons respectively. Rukwa can be divided into five agro- ecological zones as shown in Appendix 3.0.

Rukwa's agricultural potential has made the region along with Iringa, Ruvuma and Mbeya the four major maize producing regions of Tanzania, commonly referred to as the "big four". However, Rukwa is more remote in comparison with the others and two of her districts are almost totally dependent on maize as a major source of livelihood. The region has great potential for increased maize production; in the past Rukwa was well known to carry over harvests, particularly maize, from one agricultural season to the next, something that was uncommon in other regions of Tanzania with the exception of parts of Ruvuma. Even in situations of drought and low rainfall, as was the case in 2006, the region was still expected to receive rainfall up to mid April; the rains, according to Mhita (2006), the director general of the Tanzania Metrological Agency (TMA), were expected to be mainly normal with pockets of below normal rainfall. Therefore, this region if properly utilized could be a good contributor to Tanzania's food security.

Figure 3:0 Map of Tanzania (Source; http://geology.com/world /tanzania-satellite-image.shtml-4/5/2008)

Figure 3.1: Map of Tanzania Showing Administrative Regions (Source; http:// www.tanzania.go.tz/census/regions.htm-4/5/2008)

Figure 3.2: Rukwa Region's Administrative Districts (Source; http://www.tanzania.go.tz/census/rukwa.htm-4/5/2008)

3.2 Types of available data

This section highlights types of data that were available and could in some way have been suitable for the study. In sub-section 3.2.1 the thesis briefly examines some data sources that have information on Tanzania's agricultural production, including the Tanzania agricultural census of 1995 and 2002/03 agricultural censuses and the Basic Agricultural Data. In sub-section 3.2.2 the thesis considers data on living Standards; this mostly covers the Household Budget Surveys (HBS). Lastly, sub-section 3.3.3 examines some studies conducted in Tanzania addressing rural poverty whose data could be available.

3.2.1 Data on agricultural production

One set of data on agriculture of use to the current study includes the Tanzania Agricultural Census 1995 and that of 2002/03. Starting with the 1995 census or more precisely the 1994/95 agricultural census, was launched in September 1993 and completed in 1995. According to NBS the agricultural year 1 October 1994 to 30 September 1995 was the reference year. The census selected statistical unit was the agricultural household, defined as any household operating at least 25 square meters of land or owning/keeping at least one head of cattle, five goats/sheep/pigs or fifty chickens/ducks/turkeys. The census covered rural areas only; urban areas and large scale farms were considered outside its scope. The sampling frame involved a selection from the 540 villages throughout the country as the Primary Sampling Units (PSU), based on the National Master Sample designed for conducting sample surveys for Tanzania Mainland by the NBS. In order to obtain representative samples strata were developed, out of which villages were selected systematically using probability proportional to size procedure (PPS); this selection was done by stratum and from each stratum two to eight villages (PSUs) were independently selected up to a total of 540; in each of the 540 villages a sample of 15 agricultural households (SSUs) was selected for interview by the district supervisors, using systematic random sampling procedure; 8100 agricultural households were interviewed in the whole of Tanzania mainland. The census collected data on household demographics and activities of household members; crops, machinery and equipment owned by households; food storage; livestock ownership and gender issues.

Compared to the 1995 census the 2002/03 agricultural census covered both large and small-scale farms with the latter being covered in greater detail than the former. The major objectives of the censuses were;

- to identify structural changes if any in farm household holdings, crop and livestock production, farm input and implements use
- to determine any improvements in rural infrastructure and in the level of agriculture household living conditions
- to provide benchmark data on productivity, production and agricultural practices in relation to policies and interventions promoted by the MAFC and other stake holders

- to establish baseline data for the measurement of the impact of high level objectives of the Agricultural Sector Development Programme (ASDP), National Strategy for Growth and Reduction of Poverty (NSGRP) and other rural development projects and
- to obtain a benchmark data that will be used to address specific issues such as: food security, rural poverty, gender, agro-processing, marketing and service delivery.

The 2002/03 Agriculture Census collected data from a sample of 53,070 small scale farmers of which 48,315 were from mainland Tanzania and the rest from Zanzibar. The sample design is shown in Appendix 3.1. According to NBS et al. (2006) data was collected from 3,221 villages in mainland Tanzania, drawn from the National Master Sample (NMS) developed by the NBS from the 2002 Population and Housing Census. The census collected data using a small-scale farm questionnaire, a community level questionnaire and a large scale questionnaire. However, according to NBS et al. (2006) major emphasis was on the small-scale farm questionnaire. The census collected information on household demographics and activities of household members, land access/ownership/tenure and use, access to inputs and farming implements, access to credit, access to infrastructure (roads, district and regional headquarters, markets, advisory services, schools, hospitals, veterinary clinics) and crop marketing, storage and agro-processing. Information was also collected on tree farming, agro-forestry and fish farming, access and use of communal resources (grazing, communal forest, water for humans and livestock, beekeeping etc), off farm income and agricultural related activities, household living conditions (housing, sanitary facilities), labour use, livelihood constraints and subsistence versus non-subsistence activities, and gender issues. According to NBS et al. the process of data collection was done in two stages. In the first villages/enumeration areas (Eas) were selected using a probability proportional to the number of villages in each district. The second stage involved a systematic random sampling of 15 households in each Eas.

The second source of data on Tanzania's agricultural sector is the Basic Agricultural Data booklets, which cover the following periods; 1983/84 -1986/87; 1986/87-1991/92; 1992/93-1998/99; 1993/94-1999/2000, 1995/96-2002/2003 and 1998/99- 2004/05. The production of the booklets, according to the Minister of Agriculture Makweta (1993) and Bitegeko (2005), Director of Planning and Policy of the MAFC, was mainly aimed at providing basic information for 'a snap-shot picture' of the Tanzanian agricultural and livestock sectors. They also contain other information such as population data, gross domestic product figures, prices for agricultural crops, information on inputs and rainfall data. However, while some of the information is broken down to the regional level some is only presented on a national basis, especially in the latest three booklets which cover mostly the post trade reform period. The last booklet however has data on production and areas under cultivation disaggregated at the district level, but for the others information such as that on fertilizers and other inputs is for the national level.

3.2.2 Data on living standards

This data source category mainly covers the Household Budget Surveys (HBS). Tanzania in the last two decades has conducted three HBS (1991/92, 2000/01 and 2007). According to the National Bureau of Statistics (NBS) the HBS analyses mainly concentrated on four key Indicators, namely the household and housing, education, health and water, economic activities and consumption and poverty. Generally, all the three HBS collected information on a range of individual and household characteristics which included;

- Household members' education, economic activities, and health status
- Household expenditure, consumption and income
- Ownership of consumer goods and assets
- Housing structure and materials
- Distance to services and facilities
- Food security.

According to the NBS it seems the 2001/02 HBS was much more thorough than the first (1991/92) and that it was carried out with the aim of providing a baseline for the future and an examination of trends over the 1990s. Based on this, analysis of the 1991/92 HBS had to be done again to maximize its comparability of estimates over time.

Generally, sampling was not consistent in the HBS so far conducted in Tanzania. According to the NBS (2007) although the 1991/92 HBS collected very similar information to the 2000/01 survey it was much smaller. It collected data from only 4,823 households. The 2001/02 collected data from a national sample of 22,178 with a distribution of between 12 and 24 households in each sampled area and around 1,000 in each of mainland Tanzania's 20 regions. The 2007 HBS collected data from a nationally representative sample of 10,466, based on a revised national master sample developed out of the 2002 census data. Sampling weights were used to make estimates representative. According to NBS, the 2007 HBS used questionnaires similar to those used in 2000/01 to ensure compatibility.

Normally, the HBS has collected information under four key Indicators, namely the household and housing, education, health and water; economic activities and consumption; and poverty. Under the household and housing category information is gathered on average household size, mean percentage of dependants, percentage of female-headed households, percentage of households with a modern roof, percentage of households with modern walls, average number of persons per sleeping room, percentage of households with electricity, percentage of households using a toilet, and percentage of households owning a radio. Under the education, health and water category information is gathered on percentage of adult men with any education; percentage of adult women with any education; percentage of adults' literate, primary net enrolment ratio; percentage of children age 7-13 years studying; secondary net enrolment ratio (forms I-IV); percentage of households within 2 km of a primary school; percentage of ill individuals who consulted

any health provider; percentage of households within 6 km of a primary health facility; percentage of households with a protected water source; and percentage of households within 1 km of drinking water.

On economic activities the HBS collected information on percentage of adults whose primary activity is agriculture; percentage of children age 5-14 years who are working; mean area of land owned by rural households (acres); and percentage of households with a member with a bank account. Lastly, under consumption and poverty information collected was on average consumption expenditure per capita (for 28 days); and percentage of consumption expenditure on food.

3.2.3 Some other data sets/studies conducted in Tanzania addressing rural poverty whose data was available for use by the current study

This sub-section briefly explores three other possible sources of data that could have been used by the study to examine rural well-being in Tanzania in the context of 20 years of agricultural reforms. The first one is the Kagera Health and Development Survey (KHDS), the second is Moving out of Poverty in Tanzania's Kagera Regional study and the last is Moving Out of Poverty: Understanding Growth and Democracy from the Bottom Up.

Starting with the Kagera Health and Development Survey (KHDS), this research project mainly aimed at measuring the impact of adult mortality and morbidity on the welfare of individuals and households[37]. The main objective of the KHDS was to collect data for a World Bank-funded project titled "The Economic Impact of Fatal Adult Illness due to AIDS and Other Causes". This project was based on a longitudinal household survey, the Kagera Health and Development Survey (KHDS), conducted in Kagera region, Tanzania from 1991-94. A follow-up study, the Kagera Health and Development Survey 2004 (KHDS 2004) took place in 2004 as a fifth round following on the four rounds of the baseline Kagera Health and Development Survey 1991-1994 (KHDS 91-94). The KHDS 2004 was designed to provide data to understand economic mobility and changes in living standards of the sample of individuals interviewed 10-13 years previously. The KHDS 2004 attempted to re-interview all respondents interviewed in the KHDS 91-94, tracking them down even if they had moved out of the village, region or country.

The 2006 Moving out of Poverty in Tanzania's Kagera Regional study by De Weerdt mainly aimed at collecting qualitative data on movements in and out of poverty. The study is based on both a quantitative 10-year panel data set of 47 rural villages in Kagera and an extensive qualitative data set on a subset of 8 villages. The study uses a sub-sample of the KHDS villages and respondents. In collecting the qualitative data the study used FGDs (Focus Group Discussion) with 8 to 12 KHDS respondents, chosen to represent all age and gender categories. The FGDs consisted of an extensive discussion of the forces that lead

[37] This project was under the Development Research Group(DRG) of the World Bank (DRG/WB, 2004)

people to grow out of poverty or keep them locked in it. At various points respondents were confronted with the results from the econometric model and requested to give their opinion. The study also recorded life histories of 15 KHDS respondents in each village, asking them to reflect upon the past 10 years of their life and tell its history. Interviews were structured around the topics of migration, education, occupation, economics, socio-cultural and psychological factors, confidence and power.

Lastly, the 2006 Moving Out of Poverty: Understanding Growth and Democracy from the Bottom Up by Kessy et al. was part of a global World Bank research project on Moving Out of Poverty: Understanding Growth and Democracy from the Bottom Up, and it involved a total of 16 countries around the world. The study generally aimed at informing policy on trends in growth in the study area, access to markets, the role of good governance in moving people out of poverty and impending governance issues and constraints.

Based on the above briefing the thesis in the next section describes the reasons why the author found it necessary to obtain primary data from the field.

3.3 The need to use primary field data

Despite availability of the above data it was necessary to collect primary data from the field to complement the secondary data from the above sources (The basic agricultural data and the HBS). The need was to get an accurate account from the grassroots level of the status of agriculture after the agricultural reforms of the 1980s. For example the basic agricultural data, while providing information on crop production in terms of land under production (ha), production (tonnes), yield in (kg/ha) and use of inputs in the production process, do not give information on use of fertilizers per crop nor are the data disaggregated by districts, with the exception of the 2003-2005 period.

Secondly, whereas the HBS do provide information on a range of individual and household characteristics, they do not give details on some of the issues being examined by the current study, for example reasons why households are not using fertilizers in their agricultural production, or households' extension seeking behaviour. Lastly, the Kagera panel data does not represent the type of area the study wishes to research. Kagera's economy, though also dependent on agriculture, has a lower maize production potential than that of Rukwa. Kagera falls into the group of regions producing between 3.6 and 77.6 thousand tonnes per year while Rukwa is in Tanzania's top group of four regions producing in the range of 184 – 274.8 thousand tonnes per year. The importance of maize to the livelihoods of households in Rukwa is higher than its importance to Kagera's households. Furthermore, the Kagera panel data only covers the period 1991 to 2004 whereas the study is interested in the 1986 to 2006 period. Smith and Thomas (2002) have also shown that panel data, particularly those collected in developing countries have some limitations

despite the increase in the quantity and quality of data collected in developing countries by use of household surveys.

Following the above justification of why the study needed to collect primary data, section 3.5 explains in detail the methods of data collection employed by the study, how data was analysed and the presentation of results. Thereafter, section 3.6 highlights the limitations encountered by the study including the problem of unreliability of recall data which was means of seeking information for the study.

3.4 Methods of data collection

3.4.1 Research design

The study employed a mixed method design in data collection. In line with this a cross-sectional research design (Creswell, 2003) was adopted, whereby data was collected at one point and time. The choice of this method was partly warranted by its ability to meet the objectives of the study, but also due to constraints in terms of time and finance.

3.4.2 Data collection, analysis and presentation

The section explains how data used in the study was collected, analyzed and presented in later chapters. Data was collected from the three rural administrative districts of Rukwa (Figure 3.2). Collecting data from the three districts aimed at ensuring a diversified understanding of the phenomena under study in a range of localities, because households in Sumbawanga and Nkansi districts more or less depend on the maize crop as a major source of livelihood, whereas households in Mpanda are also involved in tobacco farming.

3.4.3 Sampling and sample size

The current study involved a survey of 200 randomly selected farm households involved in the cultivation of maize from the three districts of Rukwa; 72 from Sumbawanga, 67 from Mpanda and 61 from Nkansi districts. The random sampling was based on official village registers made available to the researcher by leaders of the villages involved[38]. A list of all the heads of households was prepared and names were picked at random. However, to ensure representation of female headed households (FHHs) a count was normally made and where they were not represented some adjustments were made to ensure at least some FHHs featured in the study. In case of non-appearance of selected respondents replacements were picked on a random basis. For the Focus Group Discussions (FGDs) village leaders were requested to gather individuals in groups of between six and eight for all adult (above 35 years) men's and women's groups and for all youth (18 -35 years) male and female groups; these respondents were not involved in the individual interviews. A total of 16 focus group discussions were conducted, four each in Sumbawanga

[38] Villages and number of respondents per village are shown in Appendix 3.7.

and Nkansi districts and eight in Mpanda district[39]. In each case only one village was selected to ensure a comparison of opinions between the different age and sex groups; a total of 107 individuals participated in the FGDs. Apart from individual questionnaires and the FGDs, in-depth interviews were also conducted with the district agricultural officers of the three districts. Therefore, the total number of individuals involved in the study was 310.

3.4.4 Primary data collection

Primary data was collected using pre-structured questionnaires (Appendix 3.3). These were designed in such a way as to enable collection of information capable of answering the primary questions described in section 1.6 of Chapter One. The questions aimed at determining whether the 1986 liberalization of the agricultural sector, particularly the maize market, had led to farm households' specialization in areas where they had a competitive advantage; whether the liberalization led to farm households adopting modern technologies in their production process; and how maize production fitted into households' LS, general crop production and well-being.

To answer these questions the pre-structured questionnaire was designed to collect information on the socio-economic background of the farm households surveyed, including information about the head of household's education, main economic activity, household size, farm ownership and farm size[40]. Apart from the listed items, information was also collected on the economic activities in which other household members were involved, the households' other sources of income, and 2005 annual cash income. This information was intended to show to what extent a household was diversified, what the encouraging and limiting factors to diversification might be, and the amount and quality of labour available at the household level that could actively be used in production and improvement of households' well-being. The questionnaire also sought information on the farm households' farming practices as well as types of crops, amount of land dedicated to each and whether a household had to hire land, labour or both for its production. This type of information aimed at determining among other things the surveyed households' ownership of the modes of production and the amount of diversification of their crop production. Knowing their crop diversification helps to reveal the degree of specialization in crop production. One would normally expect farmers to only grow crops for which they have a competitive advantage, to maximize their returns and profits, in short their income.

In attempting to explore the hypotheses posed by the thesis, the questionnaire gathered information on the use of modern technologies, including improved seeds and chemical fertilizers. It also sought information on extension-seeking behaviour of the surveyed households. These lines of enquiry were

[39] More FGDs were conducted in Mpanda district because some surveyed households cultivated both maize and tobacco. Four groups were composed of those growing maize and other crops but not tobacco, and the other four involved those growing maize, tobacco and other crops.
[40] Details on the variables are provided in Appendix 3.4.

based on the prediction that open markets make access to technologies and innovations easier. With the help of agricultural extension officers the farm households should be in a better position to determine which technologies are appropriate to their production. The questionnaire also aimed to get information on the farm households' well-being in the context of the long period of maize market reforms. Questions were included on farm households' income earnings and whether these have increased or decreased, and on their assets value.

Other questions included households' access to markets (actual markets and market information), information on the households' general crop husbandry, and suitability of maize farming for households' well-being, to mention a few. The interviewing process was conducted by the researcher and two assistants; to make it easier and more uniform the questionnaires were translated from English to Swahili (Appendix 3.5). A pre-testing of the questionnaire was done and some modifications were made before the actual use. The selected household heads were normally interviewed in the village government offices of their respective villages or nearby; however on one occasion we used an inhabited primary school teacher's house. To ensure respondents' confidentiality and freedom of expression, village government leaders were not allowed within listening distance; in most of the cases they were busy making follow-ups on selected respondents.

Answers to the study's hypotheses were also sought by using FGDs. These used a check list (Appendix 3.7), a shorter version of the questionnaire administered to farm households. The FGDs mainly aimed at affirming the general information provided in the individual interviews, especially in such areas as the types of crops grown in the area, gender roles in the production of maize, the importance of maize to the local area, the possibility of maize farming being an engine for poverty reduction in their area, factors hindering higher maize productivity in their area and who were the poor, to mention a few. Other questions are shown in Appendix 3.3. The FGDs participants were encouraged to discuss issues put before them without fear and with honesty. The FGDs mainly aimed at getting a better understanding of the issues explored in the individual interviews, especially to get a better conceptualization of rural dwellers' own understanding of 'poverty', their perception of the liberalized maize market, and whether maize farming in their respective areas had the potential to improve their well-being.

Lastly, in an effort to ensure reliability of collected primary data, the thesis conducted three in-depth Interviews with the district agricultural officers of the surveyed districts. The major aim of these interviews was to get a professional opinion of the subject under study and also to confirm what farmers and FGDs had reported in relation to maize market liberalization and well-being in Rukwa. The in-depth interviews were normally carried after finishing the farm household surveys and the FGDs, and employed a check list (Appendix 3.6) that was quite similar to that used in the FGDs with the exception of a few omitted questions. In general with the exception of the district agricultural officers, participation of respondents in

the current study was voluntary and to ensure this, respondents were required to sign consent forms (Appendix 3.7) before participating. In a few instances some respondents were reluctant to participate and replacements were sought.

3.4.5 Secondary data collection

Secondary data on production, input use (fertilizer and hybrid seeds) and marketing of maize was obtained from the MAFC and the Ministry of Commerce and Trade (Agricultural Marketing Bureau) and from Rukwa regional offices' reports and other data sets (FAOSTAT). These data are normally compiled in booklet form[41]. Data from the 2002/03 National Agricultural Census was also used in the current study. Rainfall data covering the 1980s to 2005 for Rukwa was collected from the Tanzania Metrological Agency. Use of secondary data was aimed at bridging information gaps generated from the interviews, FGDs and the in-depth interviews. Some questions related to the current study could only be answered by secondary data rather than primary data alone. Use of the secondary data has also enabled the thesis to get a broader general picture of the performance of Tanzania's crop production, especially maize, following liberalization of the agricultural sector in 1986.

3.5 Study limitations

In this section the thesis discusses two major limitations relating the current study. The first regards use of recall data covered in sub-section 3.5.1 in which the use of recall data in social science surveys is briefly examined followed by an examination of the limitations of recall data and ways to improve its reliability. Sub-section 3.5.2 covers the second set of limitations, i.e. those related to the actual execution of the study.

3.5.1 Use of recall data in social science surveys, its limitations and how to improve the reliability of recall data

Use of recall data in social science research is quite common; according to Dex (1991) there has been a growing use of life and work histories of individuals by social science researchers, mainly due to an increased desire for systematic collection of large scale data on social and economic aspects of individuals' lives. In support of this point, Smith and Thomas (2002) argue that despite the increase in the quantity and quality of data collected in developing countries by use of household surveys, the vast majority of these have been cross-sectional, limiting how much can be learnt about the dynamics that have brought each society to its current status quo. Furthermore, regardless of efforts being made to conduct longitudinal surveys many developing countries are still far from having usable panel data to

[41] The secondary data used are the accepted official statistics and according to Skarnstein although there have been many arguments about the reliability of sources of secondary data on Tanzania's agricultural sector, many experts (Bhanduri et al, 1993; Ponte, 1998 and Delgado et al. 1999), cited by Skarnstein (2005) agree that the data contained in the basic data for agriculture and the livestock sectors of Tanzania are the most reliable.

enable determination of changes over time. Panel surveys launched today can, at best, only tell us about the future and not the past. Smith and Thomas also argue that for a better understanding of the development process it is crucial that we capture the demographic and economic transitions of the past few decades, and the only realistic way to do this is to rely on recalling past events. The importance of recall data has also been pointed out by Gibson and Kim (2007) who argue that retrospective surveys are mainly used as a substitute of longitudinal data which involve high costs and are of limited availability. Gibson and Kim citing Deaton (1997), point out that although longitudinal surveys are costly they are often restricted to small, nationally unrepresentative samples. According to Freedman et al. (1988), cited by Gibson and Kim the above restriction has led to the need to retrospective surveys whereas a single interview can obtain a long-term or even lifetime history.

According to Dex (1991) retrospective or recall data can be collected either in a single cross -sectional survey or in conjunction with a panel survey. He argues that collection of data retrospectively allows for the continuous collection of information on particular variables as compared to discrete records obtained by asking only about current experiences. He cautions that despite the advantage of collection of retrospective data, especially by allowing a cheap way of collecting information which can then be systematically coded and analysed, it nevertheless has the potential of bias due to its over-reliance on memory. However Dex argues that the problem of memory bias does not only affect retrospective data collection but also the collecting of current information. Despite the likelihood of errors arising from use of retrospective data he points out that no method of data collection is immune to errors although the degree and influence on the accuracy of the results does vary between the various methods.

There have been many debates on the reliability or accuracy of the data collected using the method particularly in relation to long-term recall data. For example, Jacobs (2002) and Kennickell and Starr-McCluer (1997) as cited by Gibson and Kim (2007:1), claim that analyses based on such data are "quite meaningless" and that it is a "poor substitute for panel data". However, on the other hand Campbell (2000), cited by Gibson and Kim (2007:1) suggest that when retrospective questions are asked carefully and interviewers are well trained, respondents can provide "accurate and detailed information". According to Dex, errors for example in labour/employment studies may occur in retrospective surveys because respondents either completely forget events or miss-date them. However, Dex in reviewing various studies that have employed the retrospective recall of data shows that while the consistency of the information reported varied on the basis of the recall period under consideration by the specific studies, it also varied on basis of the subject matter. For example while there was a consistency of 88% for a 10 years recall period on the subject matter of having had a will or not (Powers et al., 1978), there was only a 53% consistency for a similar recall period when the subject matter was whether one would quit work if they had annuity (Powers et al 1978). Again the review shows that there was a 72 - 76% consistency in reporting for 26 years olds' recall on the job training when 15 – 18 (Cherry and Rogers 1979) with a recall

period of 8 – 11 years. However, when the subject matter was 26 years old men's reporting of nervous troubles at the age of 15-25 (Cherry and Rogers 1979) and the recall period of 1 – 11 years the consistency was 50%. The review also showed that although it is generally agreed that recall accuracy declines over time, there were nevertheless some instances when recall was shown to generally improve with an increase in the recall time. Dex (1991) cites a study by Mason et al (1976) which shows students recall of their parents schooling and social-economic characteristics improved with the increase in the length of the recall period.

Dex and McCulloch (1998) citing Beimer *et al.* (1991) argue that studies of measurement error and reliability in general have shown that error rates in studies using retrospective recall data are related to the questions asked to individuals, their order, the coded choices offered to the individuals being questioned, the interviewer, and whether respondents see the interviewer face-to-face. Miller (2007) in support of the above points out that in interrogational studies sixty year-old respondents are capable of giving reliable information about their grandparents hence enabling coverage of a family's information for up to a century. Berney and Blane (1997), comparing archive data and information gathered through an interview, have shown that it is possible to gather simple socio-demographic information with a useful degree of accuracy after a period of 50 years. Berney and Blane caution that it may not be possible to achieve a 100 percent agreement between the two, but studies have shown it is possible to obtain levels of agreement of about 80 percent with some items. They argue that such imperfect agreement could nevertheless be useful for many purposes. Berney and Blane have cited other examples of studies which have shown accuracy levels of around 80 percent. For example citing Bourbonnais et al., (1988) they report that a comparison of 100 employees' response on jobs they had held with a shipbuilder over a period of 40 years and administrative records held by the company show that the accuracy in agreement between the responses and the administrative ones only fell below 80 percent for employees who had changed jobs frequently. Citing Auriat (1992) they point out that the accuracy of recall information by 500 Belgian couples regarding their dates of change of residence during a previous period of 30 years was accurately reported at a level of 80 percent when individuals were interviewed separately but this improved to 88 percent accuracy when the couples were interviewed together.

Further evidence in support of the use of recall data despite its shortcomings comes from Berney and Blane (1997:1520). The two, citing Livson and McNeill (1962), show that simple physiological information has also been proved to be recalled with useful accuracy. The latter have shown that after a period of 17 years the age of menarche recorded in the medical notes of 43 subjects correlated at 0.75 with that recalled at interview. Citing Casey et al., (1991) Berney and Blane report that a study on recalling body weights of 95 respondents at ages 18, 30 and 40 years and at age 50 years showed that the recalled weight correlated at 0.95 with recorded weights after 10 years and 0.87 after 32 years. Citing Krall et al, (1989) they point out that even though the accuracy of recall of ingested substances presents a less

straightforward picture, tobacco smoking appears to be recalled with useful accuracy and that Krall et al., have reported an accuracy of 87 percent between the historical record of their respondents and their respondents' recall of their smoking status 20 years previously and 71% accuracy on smoking level; however the figures for a recall period of 32 years were 84% and 55% respectively.

According to Dex (1995) improvement of recalled data's reliability can be achieved by using bounded or aided recall methods, by using clues and other landmark events and context to help date events, and by focusing on particularly salient or noteworthy events. Other ways are by placing the events of interest within a temporal frame of reference, by ordering the questions in a logical or chronological sequence, and by keeping the task as simple as possible. Dex also points out that dates of events have generally been found to be the most difficult facts to remember and should be asked about last in the sequence of questions related to an event. On the whole, the reliability of recall data was found to be lower the longer the recall period and the further into the past; however, there were important differences by subject and by the salience of the subject; highly salient issues could be remembered very accurately and consistently irrespective of elapse of time. Smith and Thomas (2002) have also reported on better recall on more salient moves, for example such as those linked with other important life events such as marriage, childbirth or a job change and moves that lasted a long time.

Studies of recall on unemployment have generally found that over a short recall period, errors in the recall of work and non-working experience are small[42]. According to Freedman *et al.* (1988) recall on this topic is still reliable over a longer time span for periods of long duration. But short periods of unemployment over a long recall period (greater than one year) are likely to be systematically biased by under-representing short periods. Mathiowetz and Duncan (1988) also found that salient events improved recall reliability as did less difficult tasks (fewer spells, or longer durations), that women had better recall reliability generally. Increasing age was not found to have any effect on recall errors. They found that the period over which events were recalled had an insignificant effect on recall errors once the salience and difficulty had been controlled. Another study found that women had lower levels of reliability than prime aged men in recalling periods of unemployment (Morgenstern and Barratt 1974). Education has also been shown to affect the accuracy of recall data. For example a study in Malaysia showed that recall quality, measured by consistency of incidence and dating of moves reported twelve years apart was higher among the better educated in the Malaysian Family Life Survey (Smith and Thomas 2002). Mathiowetz and Duncan (1988) have also pointed out that the period over which events are recalled has an insignificant effect on recall errors once the salience and difficulty have been controlled. Dex (1991) citing Thomson et al., (1987) points out that making a reference to a specific event that respondents have experienced improves the accuracy of dating events.

---

[42] Freedman *et al.* 1988; Mathiowetz and Duncan 1988 and Duncan and Hill 1985.

From the above review of literature it can generally be concluded from the section that certain sorts of data can be collected with a reasonable degree of accuracy. Such types of data include individuals marital and fertility histories, family characteristics and education, their health services usage, and a broad outline of their employment history. However, Dex (1991) cautions that past levels of family income seem to be difficult to remember accurately, suggesting the need for reliance on concurrent panel data collection. The period of retrospective recall of data by individuals has been observed to affect the quality and accuracy of information gathered differently. It is also concluded that despite the errors posed by use of recall data, no method of data collection is free from error and the major goal to be considered by researchers is how best to minimize such errors. In the case of recall data they can be minimized by improving the way the data is collected; one is to use checklists, clues, landmarks, and time frames which will enable the respondent to recall with relatively increased accuracy.

The current study tried to assist the respondents recall their 1986 socio-economic and production data by reminding them that 1986 was the first year of Tanzania's second president Hon Ali H. Mwinyi. Use of the start of the presidency was hoped to stimulate the respondents thinking as this had marked the move from a socialist economy that had been marred towards the end with a shortage of most of the day to day household necessities' such as soap, cooking oil, sugar to mention a few. As Hon Mwinyi started his presidency his government adopted the free market economy which allowed import of goods which then allowed shops and local markets to be adequately supplied with not only household necessities but also other goods that had been previously been seen as luxury goods for example cars, motorcycle, refrigerators and Television sets to mention but a few. Following Hon Mwinyi's liberalization of the economy he was nicknamed *Mzee Ruhksa* literally translated as the man who allowed everything. During the interviews the name of Mwalimu (Teacher) Julius K. Nyerere was also used to prompt recall of the respondents' farm and socio-economic characteristics of those in maize production in 1986. Nyerere was quite popular due to him being Tanzania's first president; his presidency lasted between 1961 and 1985. Therefore, by using both of the above names it was hoped respondents would be able to refresh their memory and hence provide some relatively accurate data. And the above approach proved quite useful during the interviews.

3.5.2 Actual field limitations

Some limitations were encountered in the execution of the study. Some were expected, but others were quite unexpected. A prior understanding of these limitations may help in understanding the shortfalls that may arise in later chapters and also on conclusions drawn at the end of the study. The study failed to interview the planned number of about 360 respondents through individual interviews, FGDs and in-depth interviews with government officials. Due to distance between districts and selected villages only a total of 310 were eventually interviewed. The lower than planned figure was caused by a number of factors. Dispersal of the villages involved within the study area at times led to the interviews starting at mid-day.

Respondents were sometimes reluctant to participate when approached by the village authorities, or when briefed about the actual study by the researchers.

The study also encountered limitations in relation to both primary and secondary data. The limitation on primary data was based on the fact that some of the information required needed a memory recall of farm households' income and crops produced and sold in 1986, when the maize market was liberalized. The exercise of recalling information proved to be quite challenging to some respondents and therefore the validity and reliability of the data collected need to be taken with great caution. However, some of the trends, especially those related to maize production generally tally with the published secondary data used in the study, supporting the assumption that the information provided by the respondents is reliable and can be trusted. Further limitations were encountered in the secondary data used due to a lack of disaggregation of the data, especially that related to chemical fertilizer use per individual crops and per region. As a consequence, the current study had to rely on findings of other studies and many assumptions about the effect of the decline in fertilizer on Rukwa's maize productivity after liberalization of the agricultural sector in 1986.

The vastness of the coverage area, coupled with poor road conditions and the high costs involved, made it difficult to make prior appointments in the villages. Although in Sumbawanga district letters were sent in advance, the selection of respondents at random still had to wait until we arrived at the respective villages. Hence no real difference was seen in this district in comparison to the other two. Another limitation was the fact that household heads and other members were preparing for the next cropping season; this made it difficult at times to get the selected respondents. Some of them were unavailable as they were busy in their farming plots, which in some cases were far away from the village where interviews were being conducted. Lastly, another limitation was more or less coincidental; when we reached our chosen study village (Ntumbila) we found out that village leaders were cracking down on individuals who had not contributed money towards construction of their ward secondary school. This scared respondents away from coming to the village offices, our meeting point, and consequently only three successful interviews occurred out of the planned 30, the village leaders had been able to call out seven respondents but due to the tense situation it was seen proper not to continue with interviewing the other four[43].

[43] Despite the inability to interview the 30 originally planned respondents in the said village the author believes that this has no major influence on the overall findings of the study as the interviewed respondents from the replacement village had a similar distribution of characteristics as those I was able to interview in the other 4 villages of the district. Furthermore the village (Kanazi) where the replacements were sought was within the same administrative division of the same district (see Appendix 3.2). In addition data analysis in the current study was mainly based on districts and the regional level and not villages *per see*.

3.6 Socio-economic characteristics of surveyed households

An understanding the various socio-economic characteristics of the surveyed households involved in the study may help in understanding the empirical findings. The respondents' major socio-economic characteristics are shown in Table 3.1. Respondents to the current study were distributed across all age groups, as may be suggested by the overall average and those for the specific districts (Table 3.1). The distribution of household heads across all age groups emanates from the fact that in Rukwa like many other Tanzanian rural areas the adult working population consists of individuals aged eighteen years old and above: in some cases younger individuals are also involved. Many males as soon as they are mature tend to separate from their families and start up their own households either in preparation for marriage or after marriage. However, the same is not true of many females as they only separate after getting married.

Observations (Table 3.1) show that about three quarters of the respondents were male; however the actual number of male headed households (MHHs) was far greater than this. The lower number of female headed households (FHHs) was caused by the fact that some of the female respondents interviewed were only representing their spouses who could not be available for the interviews, and by the current study's use of the random sampling method, whereby names were drawn at random from village registers. The low percentage of FHHs observed in the current study is contrary to other observations of rural Tanzania, where higher percentages have been reported. For example FAO (1997) reported 30% of FHHs for Ileje district in Mbeya, 32% for Mvumi division in Dodoma and 25% in Zanzibar north. They have also reported that in Tanzania mainland 17.5% of the households are female headed. Observations from the study also show a lack of marked difference in the sex of the household heads between Sumbawanga and Nkansi districts; however, these two differed significantly from Mpanda (Table 3.1). The occurrence of female headed households can be caused by many factors including divorce, separation, death of spouses, and out-migration of spouses in search of income in the urban areas or other rural areas. According to IFAD (2007) there has been a significant increase of FHHs in many areas of Africa and elsewhere, and the causes apart from those already mentioned may include civil conflicts and wars, un-partnered adolescent fertility and family disruption. IFAD in their poverty assessment of eastern and southern Africa noted that an estimated 25-60% of rural households were headed by women when all causes of FHHs were taken into consideration.

Generally, Table 3.1 shows that a very small proportion of the household heads had attained secondary education, many were primary school leavers, one in five had attended primary schools without completing and ten percent of household heads lacked formal education. The observed education levels suggest households may be disadvantaged. Much literature shows that education can influence a households/individuals choice of a livelihood strategy[44] and that an increase in an individual's years of

[44] Unni, 1996; Winters et al., 2001; Abdulai and CroleRees, 2001; Marzano, 2002 and Galab et al., 2006, Davis et al.,

education is expected to increase one's range of work-related skills and hence the ability to acquire new skills (Minot et al., 2006). According to Minot et al., a higher level of education is expected to be associated with the production of higher value crops, more commercially oriented agriculture, and greater participation in non-farm activities.

Table 3.1 also shows that crop production was the surveyed households' main occupation and this is in line with what has been reported for Rukwa by NBS/RCCO (2004), in Nkansi district it was the main occupation of all the household heads. The results conform to official estimates for Rukwa, according to NBS et al. (2006) 99.8% of the region's households generally grow crops, with about 34% growing crops and keeping livestock. Table 3.1 further shows that average household size was relatively higher than the 5.1 and 4.9 averages reported for Rukwa and Tanzania respectively by NBS (2002). The results also show some relative differences between the districts, with Sumbawanga having the smallest and Mpanda the highest household sizes respectively.

According to Table 3.1 the average 3.19 ha of land owned by households was in conformity with the official estimate of about 3.0 ha observed for Rukwa in the 2002/03 National Sample of Agriculture (URT, 2006). And the same is true for the amount of land utilized as the census showed that households in Rukwa were on average utilizing about 2.0 ha of the land they had access to which is not very different from what the study observed as shown in Table 3.1. However, at the district level households in Mpanda owned relatively more land compared to the other two districts, Sumbawanga having the least. On ownership of cropping land by gender of household head, ANOVA results (Appendix 5.2) show the presence of a significant (0.05 level) variation between the two sexes; FHHs on average owned less compared to MHHs. This observation is in line with the actual situation in most parts of Tanzania; land ownership is mainly a male right as a result of the highly entrenched patriarchal system[45].

Socio-economic characteristics of household heads and their household members are quite important in answering the major hypotheses asked by the thesis in Chapter One and in giving a better understanding of rural livelihoods, crop production and well-being and other arguments presented in Chapter Two. For example a household's income could be very crucial in determining how households could invest in new technologies and also in meeting their well-being needs. And according to Table 3.1 a wide range in households' cash income was observed, with some households reporting an income of as low as 9000 Tanzanian shillings and some as high as around 5,000,000 million shillings as regards the per capita cash income this ranged from about 1,500 to 2,000,000 shillings and the average was about 117,000. It should

---

2008

[45]However, in some Tanzanian tribes some matrilineal societies exist where land is controlled by daughters/aunts or uncles on the daughters' behalf. As regards general land ownership, FHHs are still disadvantaged despite efforts by the government to ensure equal access to this very important production asset between the sexes as acknowledged by the 1995 Land Policy and 1999 Village Land Act, whose objectives were to ensure women in Tanzania have the same access to land distribution as men.

be noted that these figures are total household cash income, and that income here refers to cash income thereby excludes the value of income received in-kind such as the value of own-produced food, gifts and subsidies. As such, this is not an ideal measure of household welfare but was determined in large part due to study constraints[46].

Table 3.1: Socio-economic characteristics of households

Characteristic		Rukwa region n=200	District		
			Sumbawanga n=72	Mpanda n=67	Nkansi n=61
Household head's average age		44.4	43.6	45.1	44.4
Respondents' Sex	Male	153 (76.5)	53 (73.6)	57 (85.1)	43 (70.5)
	Female	47 (23.5)	19 (26.4)	10 (14.9)	18 (29.5)
Household head's gender	Male	169 (84.5)	59 (81.9)	61 (91)	49 (80.3)
	Female	31 (15.5)	13 (18.1)	6 (9)	12 (19.7)
Household head's Educational Level	Primary school leaver	121 (60.5)	47 (65.3)	46 (68.7)	28 (45.9)
	Secondary school leaver	6 (3.0)	3 (4.2)	1 (1.5)	2 (3.3)
	Adult education	9 (4.5)	6 (8.3)	0 (0.0)	3 (4.9)
	No formal education at all	24 (13.0)	10 (13.9)	4 (6.0)	12 (19.7)
	Lower levels of Primary School (< std 7)	38 (19.0)	6 (8.3)	16 (23.9)	16 (26.2)
Household head's main occupation	Crop farming	193 (96.5)	67 (93.1)	65 (97.0)	61 (100)
	Salaried employment	6 (3.0)	4 (5.6)	2 (3.0)	0 (0.0)
	Other (e.g. fishing)	1 (0.5)	1 (1.4)	0 (0.0)	0 (0.0)
Household size	Average household size	5.88	5.29	6.22	6.21
Household's land ownership (ha)	Average land owned	3.19	2.45	4.24	2.93
	Average farmed land	2.29	2.10	2.35	2.45
Household income (Tsh)	Average Household income (2005)	521,947.00	475,069.00	704,411.00	376,867.00
	Income range (2005)	9,000 – 5,284,000.00	9,000- 3,000,000.00	10,000- 5,284,000.00	12,000 – 2,670,000.00

Source: Survey data 2006 *NB*: Number in brackets indicate percentage

[46] In Chapter 7, where this variable is used for analysis of household well-being, it is compared and contrasted with other measures of wellbeing, such as ability to cover health and education costs, and the value of household assets, which are probably more robust estimates of household welfare. In addition, in order to minimize the influence of very large values on results, the regression analysis uses the natural logarithm of household income.

Chapter Four

An overview of Tanzania's Agriculture

4.0 Introduction

This chapter aims to provide a background on the changing context of agriculture in Tanzania. Section 4.1 starts by reviewing reforms undertaken in the sector since Tanzania got her independence in 1961.In section 4.2 the chapter analyses trends in crop production of six selected crops; maize, rice, beans (food crops) and groundnuts, sunflower and tobacco (cash crops) and reveals constraints farmers face in their production. With the exception of maize the other five crops will only be looked at briefly in section 4.2 and maize is covered in detail in section 4.3 by examining its production before and after liberalization of the maize market in 1986.

The selection of the above crops is mainly based on the fact that during the study they were the most important crops according to the respondents, so looking at them at the national level will offer a basis for understanding observations from the study which are presented in Chapter Six. Furthermore, maize, rice and beans are important crops in relation to Tanzania's food security. The cash crops selected are also popular not only in Rukwa but in other regions of Tanzania too. For example due to the socio-economic reforms undertaken in Tanzania, there has been a rise in industries making vegetable oils, hence demand for sunflower, groundnuts and other oil seed has risen. Tobacco is grown in other regions such as Tabora, Ruvuma, Kagera Singida Iringa and Mbeya, and tobacco is Mpanda's (Rukwa) major cash crop. The chapter uses secondary data from FAOSTAT and the Basic Agricultural Data booklets from Tanzania's Ministry of Agriculture and some rainfall data for Rukwa from Tanzania Metrological Agency.

4.1 An overview of Tanzania's agricultural sector reforms

This section examines Tanzania's agricultural sector, particularly food crops, before the liberalization of the agricultural (and hence the maize) market. The examination enables a better understanding of how the sector was performing before the liberalization of input and product markets, as a basis for understanding observations in Chapters Six and Seven. Understanding the evolution of the reforms and their effect on Tanzania's agriculture will enable a better interpretation of the current policy debates regarding agricultural growth or increases in agricultural productivity and rural farm households well-being which are examined in Chapters Six and Seven respectively.

Tanzania's agriculture has passed through a series of ups and downs. URT *et al.* (2000), for example, point out that at independence in 1961 Tanzania's agricultural sector was mainly dominated by smallholder farmers' operating at a subsistence level and not much has changed since then, though some farmers are now operating at a semi-subsistence level. URT *et al.* (2000) further point out that from 1961 to the 1980s, when export crops were being controlled by marketing boards established by colonial

authorities, grain marketing was largely unregulated as the colonial government had withdrawn from intervening in this sector. According to URT *et al.* (2000) the new government in 1962 enacted the Agricultural Products Control and Marketing Act, resulting in the establishment of a three-tier single-channel marketing system for maize, rice, wheat, oilseeds, cashew nuts, and cotton[47]. According to Meertens (2000) the 1961 drought was the major factor causing the government to institutionalize the cooperative systems through the above act. URT *et al.*, point out that the NAPB made several attempts to set prices at several levels of the marketing chain but failed, and therefore opted to fix in-store prices, allowing producer prices to vary according to cooperative costs. Citing Maro (1999) and Sarris and van der Brink (1994), URT *et al.* point out that during the 1961- 1966 period, movement of more than 360 kg of grain was illegal, but enforcement was difficult, which led to the growth of a parallel market.

Tanzania's adoption of the ideology of 'Socialism and Self-reliance' (*"Ujamma na Kijitegemea")* in 1967 led to further state control of the agricultural sector in terms of both production and marketing. Implementing this ideology, the government nationalized plantations, estates, importer/exporter firms and food processing firms, along with other large private businesses such as banks, insurance companies, and other large-scale industries. According to URT *et al.*, (2000) the major milling companies nationalized were merged to form the National Milling Corporation (NMC), which in 1973 took over the functions of the NAPB after the latter was abolished[48]. The NMC was also granted a monopoly on imports of agricultural products by the government. Following these changes the list of scheduled crops was extended, and pan-territorial prices were introduced at the producer level; according to Geir (1995), cited by Meertens (2000) this meant that the same price was offered for a particular crop in all Tanzanian villages in 1974 -1975. Meertens points out that in order to facilitate farmers' planning crop prices were normally announced before the start of the cropping season. On the production side the nationalized farms were turned into state plantations.

State control of marketing of agricultural produce did not work favourably for the agricultural sector. For example, according to Sijm (1997) cited by URT *et al.* (2000) food marketing was adversely affected by low producer prices, financial problems at the NMC, shortages of consumer goods necessary to motivate farmers, and lack of fuel and spare parts for the transport sector[49]. URT *et al.*, citing Sarris and van der

---

[47] According to URT *et al.*, (2000) the system involved primary cooperative societies supplying the "scheduled" crops to regional cooperative unions, who then sold them to a national marketing board, the National Agricultural Products Board (NAPB), which handled all "scheduled" crops with the exception of cotton.

[48] The abolition or splitting up of the NAPB by the Tanzanian government, according to Meertens, paved the way for the formation of crop authorities which took over marketing functions from cooperatives. Meertens adds that in 1975 village multi-purpose cooperatives were installed and in 1976 the previous member-based cooperatives were officially dissolved.

[49] According to Keeler et al., (1982), cited by Putterman (1995) about 46 % of the maize bought by NMC in the 1970s was sent to Dar es Salaam leaving areas including Mbeya, Morogoro and Mwanza to depend on parallel markets for 70 – 80% of their needs. As illegal trade grew and procurement costs for NMC purchase of maize from the remote south west escalated, Tanzania started to rely more on imports. Following this NMC was only able to procure 88, 000 tons locally while on average selling 263,000 tons. According to Putterman maize imports totalled 251,000, 150,000 and 133, 000 tons in 1980, 1981 and 1982 respectively.

Brink (1993), point out that the situation got worse in the early 1980s, when per capita production of agricultural exports fell by 50% from its peak in 1970. Following these failures and the continued underperformance of the economy since the late 1970s, Tanzania had no choice but to sign an agreement with the World Bank and the IMF in 1986 to adopt SAPs. Through the SAPs various programs, including the Economic Recovery Programme One (ERP I) in 1986, ERP II, Economic and Social Action Plan (ESAP) and the Priority Social Action Plan (PSAP) in 1989 were put in place (Lugala, 1997). Through the SAPs Tanzania undertook socio-economic reforms, including trade, and reforms in the agricultural sector. Following the reforms the government abolished the 500 kg limit of the amount of grain one could privately trade (Coulter and Golob, 1992 and Amani et al. 1989 as cited by URT *et al.*, 2000). The government also reintroduced the cooperative system following problems of financial mismanagement, over-staffing, and high costs in the crop authorities. Following this change the village took the role of the primary society, selling directly to marketing parastatals. According to Maro (1999), cited by URT *et al.*, (2000), this made matters worse for NMC, which was already operating at huge losses following its attempt to support pan-territorial prices. Maro points out that although this system seemed to have benefited more remote maize surplus areas (e.g. the Southern Highlands of which Rukwa is a part), it led to NMC accumulating debts to the tune of US$200 million in 1980.

The major turning point in the agricultural reforms was during the 1984/85 budget at which the easing of restrictions on agricultural marketing was announced (Temu and Ashimogo, 1998). The 1986 agricultural market reforms brought an end to the setting of pan-territorial crop prices by the government at the start of each crop buying season. They also allowed new market players to participate in the purchase of both cash and food crops, which was formerly only done by cooperatives and crop authorities in the case of cash crops, and by NMC in the case of cereals and other staples[50]. However, after the liberalization of crop markets in 1986 farmers have been free to sell their crops to cooperatives or private traders as they wish. According to URT *et al.*, (2000) domestic food markets were the first to be liberalized following reforms in the agricultural sector, which came in alongside the above mentioned economic reforms. The deregulation of food trade between 1986 and 1989 allowed private traders to participate in food crop trading starting with maize and rice and crop movement controls were abolished in 1987.

According to Amani and Maro (1992) as cited by URT *et al.* (2000), following these reforms the NMC was initially given more autonomy in management, but was forced to scale back its operations and cover its costs. This included the transfer of the Strategic Grain Reserve (SGR) from the NMC to the newly created Food Security Department in the Ministry of Agriculture. According to Maro (1999), cited by URT *et al.* (2000), pan-territorial producer prices had effectively been abandoned by 1989 and the fixed-price single channel marketing system evolved into a multi-channel one in which the main intervention in grain markets

[50] Limited trade of small quantities of cereals and other staples not exceeding five bags, each weighing about 100kg, was allowed within local markets.

was through purchases by the Strategic Grain Reserve (SGR) to cover emergency food needs. Private traders' ability to pay higher prices for maize near the main consumer markets led the NMC and later the SGR to purchase their maize from more remote regions including the Southern Highlands (Iringa, Mbeya, Ruvuma and Rukwa).

The major objective of the agricultural reforms, according to Temu and Ashimogo (1998), was to increase Tanzania's agricultural productivity through improvement of market access for both inputs and outputs. However, many years after the above stated reforms were introduced not much has changed. Empirical evidence from literature (Skarnstein 2005 and URT et al., 2000) show that farm households' maize productivity has declined following the 1986 reforms and that the same is true of cash crops[51]. Many farm households remain subsistence producers and the sector remains dominated by the use of poor technologies; about 70 percent of Tanzania's crop area is cultivated by the hand hoe, 20 percent by ox plough and only 10 percent by tractors. Tanzania's agriculture is mainly dominated by food crop production that is highly dependent on rainfall. In total, about 5.1 million hectares are cultivated annually, of which 85 percent is under food crops. According to URT (2004) Tanzania's agricultural GDP has grown at 3.3 percent per year since 1985, with the main food crops at 3.5 and export crops at 5.4 percent per year. URT (2004) notes that the performance of the agricultural sector falls far short of the required levels of 6-7 percent needed for halving abject poverty by 2010.

Generally, since independence the Tanzania government has made several efforts geared at raising her agricultural productivity. Meertens (2000) for example points out that between 1962 and 1965 the government initiated several programs that introduced fertilizers, pesticides and increased mechanization and due to these efforts to invest more capital in agriculture the country's grain exports surpassed imports. To boost Tanzania's maize production the government instituted the National Maize Programme in 1975, based in the ten most important maize growing areas of the country. The programme aimed at increasing Tanzania's maize production through government subsidized input packages of fertilizers, insecticides and hybrid seeds and this led to a heavily subsidized consumer price for maize meal by the late 1970s. However, despite these efforts the government's involvement in the marketing of both export and food crops which started in the late 1960s and early 1970s did not do much to help maintain the agricultural growth rates reported above by Putterman, even though there were some success stories especially in relation to the production and purchase of food crops in remote areas of Tanzania. Putterman points out that by the early 1980s low and late official payments and the unreliability of crop pick-ups led farmers in many parts of Tanzania to stop or reduce the amount of maize they were selling to NMC. According to Bryceson (1993), cited by Putterman, maize purchases from farmers fell from 220,400 tons in 1978-79 to 104,600 tons in 1980-81 and to 71,000 tons in 1983-84. Putterman states that cash crop production was also adversely affected by the reduction of farmers' efforts in response to the little share of the world

[51] Putterman, 1995; Meertens, 2000 and URT et al., 2000.

market price they were receiving and their reliance on the official marketing channel, in comparison to food crop producers who could find alternative buyers in the parallel markets. Citing Ellis (1983), Putterman (1995) points out that the proportion of the world price that producers were getting for the six major export crops fell from 70.3% in 1970 to 41.7% in 1980, which led to a reversal of the long-term upward trend in the production of export crops. He adds that from the 1976-1977 season to 1985-86, cotton production fell from 65, 930 to 32,846, cashew nut from 97,626 to 25,773 tons, tobacco from 18,822 to 15,040 tons and pyrethrum from 3,251 to 1,351 tons; their corresponding growth rates were -7.4, -13.8, -2.5 and -9.3% respectively. Putterman points out that due to a world market price boom in 1976-1978, coffee output grew by 10.3% a year from 1976-1977 to 1980-1981; however it then fell by 4.4 % a year until 1985-1986.

The Tanzanian government's attempts to address the problems of production and marketing of food and cash crops through the reintroduction of cooperative unions in 1984 did not rectify the downward trend described above. Putterman states that this was because they turned out to be another of the many public entities that did very little to enhance efficiency. The formation of the cooperatives, according to Putterman, both at the village level (village primary societies) and the level of regional unions, did not meet the international standards required, as membership was automatic for any villager aged eighteen years and above rather than based on share capital. The cooperatives therefore failed to deliver and got into huge debts, forcing the government to come to their rescue, quite often when state-owned banks refused them credit for their operations. Though the government made many efforts to reform the cooperatives in the 1990s, nothing much changed and by 1993 a significant decline in their operations started to become a reality in areas where food crops were an important part of their business. Putterman gives the example of NJOLUMA cooperative in southern Iringa, which reduced grain purchases from about 40,000 tons per year (about 90% of its business) in the late 1980s to only 10,000 tons in 1992-93. Following the decline in agricultural production coupled with poor performance of the general economy, the Tanzanian government under pressure from the IMF and WB embarked on 'market oriented reforms' in an effort to turn the situation around. However, according to Putterman the national production of important food crops such as maize and rice has stagnated since 1991 despite the positive economic developments of the period 1986 to 1991 which made Tanzania one of the better performing African countries in relation to SAPs (Clever, 1993), cited by Putterman (1995).

In summary, Tanzania's agricultural growth in the 1980s was less than the population growth rate (Meertens, 2000). The underperformance of Tanzania's agriculture was contrary to the relative success story of the period before independence in 1961, when according to Putterman (1995) the country, then known as Tanganyika, had recorded success in the development of commercial smallholder agriculture. Putterman states that this period saw a vigorous flowering of African smallholder production of cotton and coffee and the formation of economically successful member-based marketing cooperatives in the main areas where those crops were grown. He further points out that during the decade following independence

grain exports surpassed imports. Smallholder farmers produced export crops; coffee, cotton, cashew nuts, tobacco and tea and these recorded annual growth rates by volume averaging 6.8, 7.1, 9.4, 18.0, and 10.1 respectively. However the above marketing cooperatives[52], according to Putterman (1995), were mainly concerned with protecting producers' profit margins; therefore their involvement with the food crop sector was very limited.

4.3 Tanzania's crop production trends of five selected crops

In this section the thesis briefly examines production of five of the six selected crops the chapter is offering an overview of. In sub-section 4.2.1 the chapter examines the two food crops, rice and beans and in 4.2.2 it looks at the three cash crops, groundnuts, sunflower and tobacco.

4.2.1 Food crop production trends

Bean production

As pointed out in section 3.0 common beans (*Phaseolus vulgaris*) play an important dietary role for most Tanzanians. According to CIAT (2008) together with maize and rice they are the major food crops for smallholder farmers in Tanzania: about 75% of rural households depend on beans for daily subsistence. CIAT further point out that beans are an important source of protein for low-income families in rural and urban areas, providing about 38% of utilisable protein and 16% of daily calorific requirements. Due to the importance of beans to the Tanzanian population the national bean research programme (NBRP) was initiated in the early 1980s with the objective of identifying high yielding varieties that are also resistant to diseases and insect pests. According to CIAT five improved bean varieties have been released in the last twenty years by the NBRP in collaboration with Sokoine University of Agriculture and other organisations have released five improved bean varieties, with support from the Government of Tanzania (GoT), CIAT and the Eastern and Central African Bean Research Network (ECABREN). In addition to the varieties, several improved production practices were disseminated.

Figure 4.1 shows that Tanzania's bean yield (kg/ha), like land allocated to bean production, has been gradually increasing from 966 to 2006; the overall correlation (0.377) between this period was positive but statistically insignificant. However, dividing the above period into two pre and post-reform periods reveals a different picture. A correlation analysis of annual average bean yield with annual area planted with beans shows a correlation of 0.237 for 1966 – 1985, and -0.032 for 1986 to 2006, however both are statistically insignificant. The 1987 – 2006 observations suggest that despite the gradual increase in area (ha) under bean cultivation, yield (kg/ha) remained almost the same (Appendix 4.2). Nevertheless, the

[52] According to Putterman the major cooperatives formed at that time were the Kilimanjaro Native Coffee Growers Union (KNCU) and the Victoria Federation of Cooperative Unions (which dealt with cotton).

figure shows that after liberalization of the agricultural markets in 1986 there seems to have been some decline and some slight stagnation until 1995, when the trend started to rise[53].

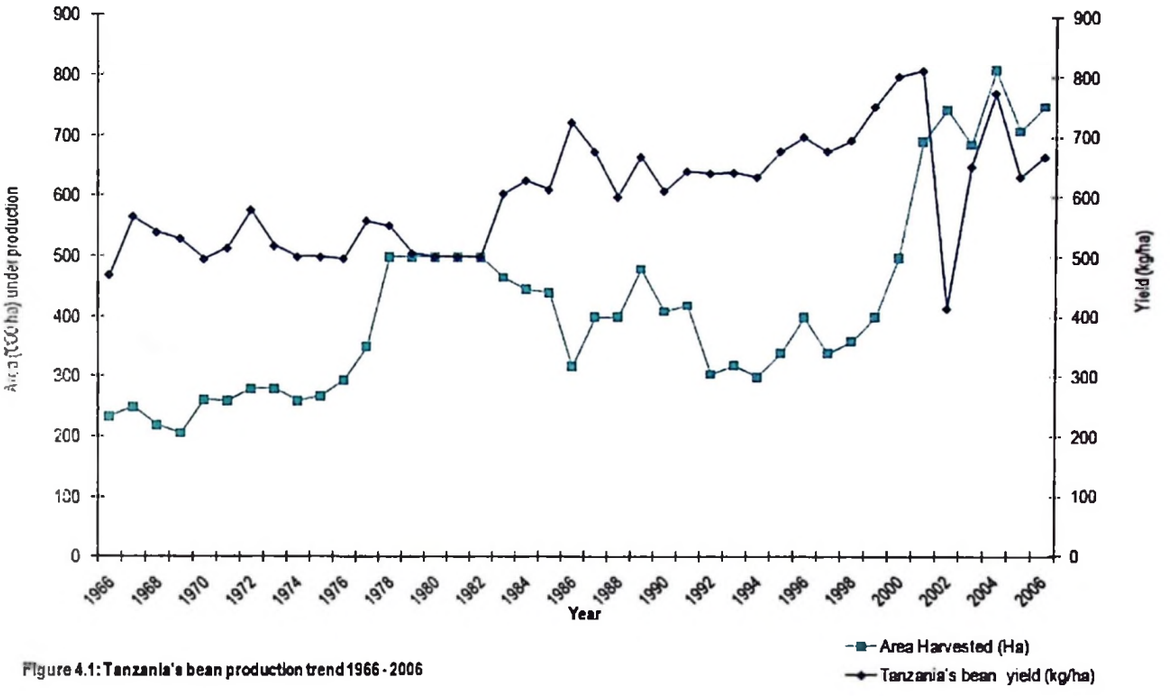


Figure 4.1: Tanzania's bean production trend 1966 - 2006

Source: The above graph has been constructed using data from FAOSTAT Online (November, 2009)

Generally, constraints facing bean producers in Tanzania include edaphic factors such as nutrient constraints, particularly N and P deficiency, soil acidity including Al and manganese toxicity, and drought (Graham et al. 2003). Others are poor agronomic practices: lack of improved cultivars, moisture stress, weed competition and damage caused by pests and diseases, drought and poor crop management, such as late weeding (Allen *et al.*, 1989 and Hillocks et al., 2006).

Rice production

Rice (*Oryza sativa*) was first introduced to the East African coast by traders from Sri Lanka and India sailing via Oman to Somalia, Zanzibar and Kilwa some 200 years ago (Carpenter, 1978, cited by Meertens et al., 1999). However, it's spread into the hinterlands of Africa along the slave trading routes from the East African coast and Zanzibar to Zaire occurred during the mid 19th century. Meertens et al., citing Iliffe (1979), point out that from 1852 the area inhabited by the Wanyamwezi in central Tanzania became an

[53] Based on data limitations the study assumes that factors such as erratic rainfall and perhaps attack by pests may have been a cause of the decline. For example FEWS (2002) point out that despite the Tanzania having had an overall national food surplus in 2002 some 22 districts had produced less than their estimated requirements. FEWS further point out that the overall food surplus had been due to good rainfall in most parts of Tanzania, however the northern regions for example Arusha (now two regions of Arusha and Manyara) and Kilimanjaro which are normally good producers of beans did not receive adequate rainfall. FAO/GIEWS (2002) also pointed out that dry weather could be responsible for dampening bean production prospects in Tanzania in 2002. The sharp decline in yield observed in 2002 could in some way contribute to the negative correlation observed between average annual bean yield and average annual land under bean cultivation.

inland base for traders from 1852 onwards causing formerly unknown crops such as maize, cassava and rice to be carried along the caravan routes to supplement the local diet of millet, sorghum and banana. It's believed that cultivation of rice was generally started by Arab traders who settled in these areas; however local farmers, initially seemed to be uninterested in cultivating rice, as its production turned out to be less reliable in comparison with millet and sorghum. According to Thornton and Allnut, (1949) as cited by Meertens et al., increases in rice production in Sukumaland were observed by British colonial agricultural officers in the 1930s, who reported the importance of rice as a cash crop in some areas. However, its production decreased between 1936 and 1956[54]. Other literature shows that rice cultivation was introduced to the Usangu plains (Mbeya region) by immigrants from India in the early 1930s (Friis-Hansen, 1999).

Rice production has recently picked up in many areas of Tanzania. For example its cultivation increased tremendously in Sukumaland during the 1970s and 1980s, apparently associated with the decline in cotton production between 1967 and 1986 (Meertens et al., 1999). In Tanzania, rice is mainly grown by small-holder farmers. During the socialist era the government had tried to set up some big commercial farms, for example Kapunga rice farms in the Usangu plains, but, these projects were abandoned and now have been privatized following the market reforms of the 1980s and 1990s. Most of Tanzania's rice farming is reliant on rain and FAO (2002) argues that for sustainable rice production, Tanzania needs to establish appropriate policies which provide support to farmers especially in terms of input supply and output marketing. Therefore, FAO argues that further development of lowland rice production with improved water supply and control would be essential to attain sustainability.

Figure 4.2 shows Tanzania's rice production trend between 1966 and 2006. According to the figure both land under rice cultivation and yield have been raising; however the rise in land under cultivation seems to be higher than that of yield. Despite the gradual rise, Figure 4.2 shows the existence of some notable ups and downs, both in land cultivated and yield[55]. Further to the above, Appendix 4.3, which examines the production trend between 1986 and 2006 shows that whereas there was a gradual increase in land under rice cultivation, yield was gradually declining. Whereas the correlation between area under rice cultivation in 1966 – 2006 was positive (0.365) and statistically significant (0.05 level), dividing the period into two periods, pre-reform (1966 -1985) and post-reform (1986 – 2006) gives us correlations of 0.027 and -0.079 respectively; both are statistically insignificant. This observation suggests that despite the overall increase in yield related to increase in land under cultivation, after the 1986 agricultural markets reforms rice yield

[54] Thornton and Allnut, (1949) cited by Meertens et al. (2000).

[55] Reasons given in page 49 (footnote 52 i.e. those for decline in bean yield) could also be applicable here. The sharp decline in rice yield observed in 2002 could in some way contribute to the negative correlation observed between average annual rice yield and average annual land under rice cultivation. In addition as pointed out earlier by IRRI (2007) irregularities in the weather pattern is a major constraint to rice production in Tanzania.

has slightly decreased. Due to data limitations the study assumes that some of the constraints reported in literature below may be responsible to the decline.

Constraints on rice production in Tanzania include drought in upland areas and drought and flash flood in rained lowland (or inland swamp) areas because of irregular weather; infestation of red rice in the irrigated schemes; inadequate and irregular input supplies: seeds, fertilizer, and credit; lack of small farm equipment, especially for post harvest operations; lack of effective farmers' organizations and cooperatives; poor maintenance of irrigation facilities; and lack of a well-defined rice policy. Others are poor road networks and marketing systems, labour shortage because of competition from other crops and weak research and extension support (IRRI, 2007).

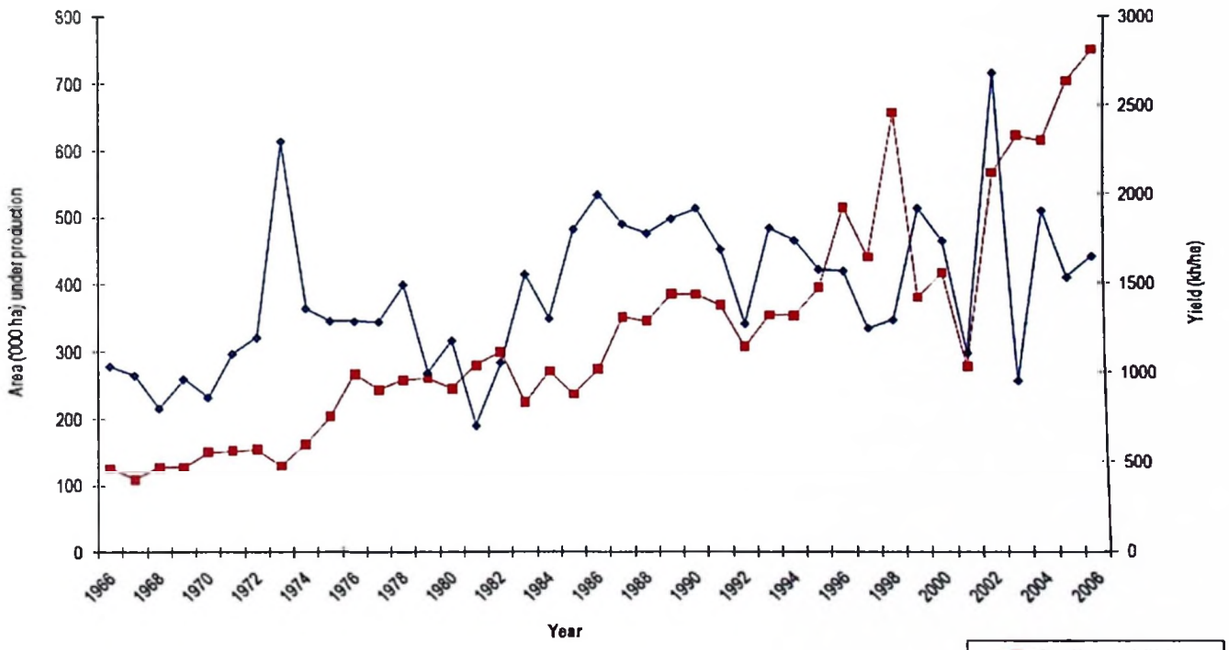


Figure 4.2: Tanzania's rice/paddy production trend 1966 -2006

Source: The above graph has been constructed using data from FAOSTAT Online (November, 2009)

4.2.2 Cash crop production trends

Groundnut production

Groundnuts (*Arachis hypogaea*) was introduced into Tanzania (then Tanganyika) in the 1940s by the British Overseas Food Corporation (BOFC)[56] through the famous 'groundnuts scheme', which covered Kongwa (Dodoma region), Urambo (Tabora region) and Nachingwea (Mtwara region). However, the scheme failed and was abandoned in the early 1950's (Munene[57]) whereby farmers in Urambo switched to

[56] Hodge, 2007 and RLDC, 2008.
[57] date unknown-http://idrinfo.idrc.ca/archive/ReportsINTRA/pdfs/v11n1e/110494.pdf)

tobacco farming. Generally, the crop in Tanzania is grown by small-holding farmers and is one of the major raw materials for edible vegetable oils in the country[58]. The other major oilseeds for edible vegetable oil include sunflower, sesame, cotton, and palm oil, whose contribution stands at 36%, 15%, 8% and 1% respectively; groundnuts contribute 40% (RLDC, 2008). Currently, groundnuts are grown in most parts of Tanzania below 1500 m altitude, according to Mwenda et al (1985) as cited by the WGoP, the most important growing regions are Mtwara, Tabora, Shinyanga, Kigoma, Dodoma , and Mwanza, where annual rainfall varies between 500 and 1200 mm. The above regions fall under two main zones, with the first zone, covering Mtwara, Ruvuma, Kigoma, Shinyanga, and Mwanza, receiving rainfall once a year (uni-modal) falls from October/November to May/ June with a brief dry spell of a few days to a few weeks in January or February. The second zone covers Morogoro, central and north eastern parts of the Tanzania where rainfall is bi-modal with short rains in November/December and long rains from March to May/June.

Groundnut production trends in terms of harvested area, yield, and total production are shown in Figure 4.3 it shows that whereas land under groundnut cultivation has been gradually increasing since 1966, yield has not generally followed the same trend; in some instances some decline is evident. Between 1986 and 2006, Appendix 4.4 shows that there has been a general increase in groundnut yield between 1986 and 2006, though the extent of increase did not match the increase in area under cultivation. Correlation analysis results further show that there was a positive correlation of 0.275 between area under production and groundnut yield between 1986 and 2006; however this was not statistically significant. The correlation for the pre-reform period (1966 – 1985) was negative, 0.770, and statistically significant at the 0.01 level. As for the overall (1966 – 2006) correlation this was also negative (0.202) but statistically insignificant. Generally, the results suggest that groundnut yield seems to have changed from its downward trend between 1966 and 1985 and started to rise during the 1986 – 2006, perhaps in response to the needs of the oil industry following liberalization of the economy and greater availability of buyers, particularly the vegetable oil industries.

According to Sibuga et al (1992), cited by WGoP (2003), constraints on the production of groundnuts in Tanzania include adverse weather conditions, particularly unreliable rainfall which has been recognized to be partly responsible for low yield. Others causes of low yield are lack of improved seeds, poor agronomic practices, and pests and diseases (Kafiriti, 1990, cited by WGoP). The major diseases limiting crop production are *Cercospora* leaf spot and rosette virus.

[58] Sibuga et al. (1992) cited by World Geography of the Peanut (WGoP), (2003).

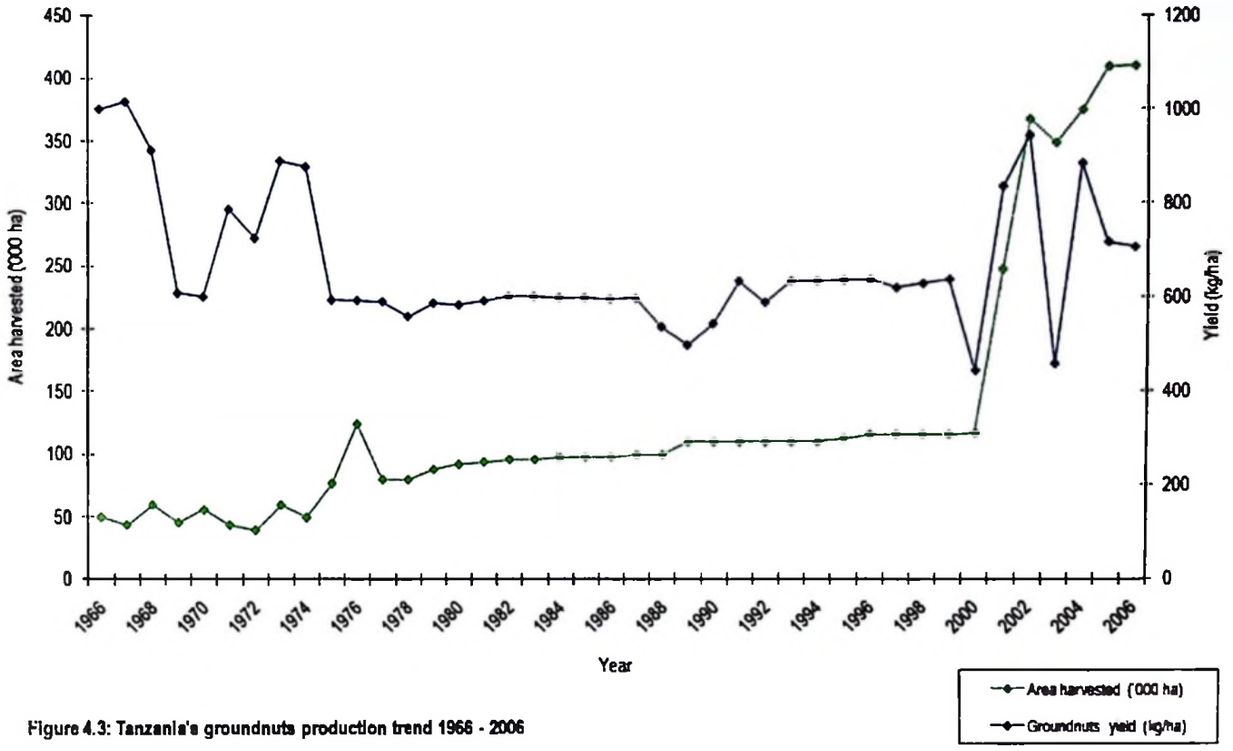


Figure 4.3: Tanzania's groundnuts production trend 1966 - 2006

Source: The above graph has been constructed using data from FAOSTAT Online (November, 2009)

Sunflower production

As mentioned earlier sunflower (*Helianthus annuus L.*) is one of the most important oilseed crops in Tanzania. Sunflower was introduced in Tanzania (Tanganyika) during colonial times by the BOFC; its origins are in America from where it was taken to Europe by the Spanish (RLDC, 2008). According to Mpagalile et al., (2008) and RLDC (2008) the crop's high adaptability has enabled its cultivation over a wide range of environments and therefore its wide spread in Tanzania. The crop is popular in the Eastern, Central, Northern and Southern Highlands of Tanzania. Mpagalile et al., citing ARI Ilonga (2008) point out that sunflower was currently contributing about 40% of Tanzania's cooking oil. Most of Tanzania's sunflower, according to RLDC (2008), is grown by small farmers; therefore a higher productivity could be seen as vital in helping to reduce rural poverty or improve well-being in rural areas. Mpagalile et al., argue that sunflower production has great potential to contribute to increasing household income and security and thus rural well-being, if promotional activities are encouraged. They further point out that sunflower production has a high potential for quick expansion to ensure an adequate supply of cooking oil, mainly due to the increased installation of processing machines for oil pressing in various localities in Tanzania.

Figure 4.4 shows Tanzania's sunflower production trend for 1966- 2006. During this period there was an expansion in area under sunflower cultivation, which seems on average to be associated with relative increases in yield. Dividing the period into two i.e. 1966 – 1985 (Appendix 4.5) and 1986 – 2006 (Appendix 4.6) also shows a similar trend; however, general correlation analysis results suggest that positive relationships between area under cultivation and sunflower yield were 0.647 and 0.232

respectively, and the overall correlation was 0.150. Whereas the overall and the 1986 -2006 correlations were statistically insignificant the 1966 – 1985 one was significant at the 0.01 level. These observations are quite a surprise as Tanzania seems to have performed relatively well during the pre-reform era as compared to the post reform one. Due to data limitations the thesis is unable to clearly pinpoint the causal factors for this difference. One explanation for it could be the fact that during the socialist era, the government was trying to limit Tanzania's reliance on imports and invested in import substitution industries that aimed at utilizing raw materials produced within the country. Among these industries were the vegetable oil industries which needed inputs such as sunflower seeds, groundnuts, and cotton seeds. The government's emphasis on supporting production of sunflower through extension staff and provision of quality may have changed following liberalization of the agricultural sector and other sectors of the economy, which saw an inflow of cheap cooking vegetable oil from the Far East (Mpagalile et al., 2008).

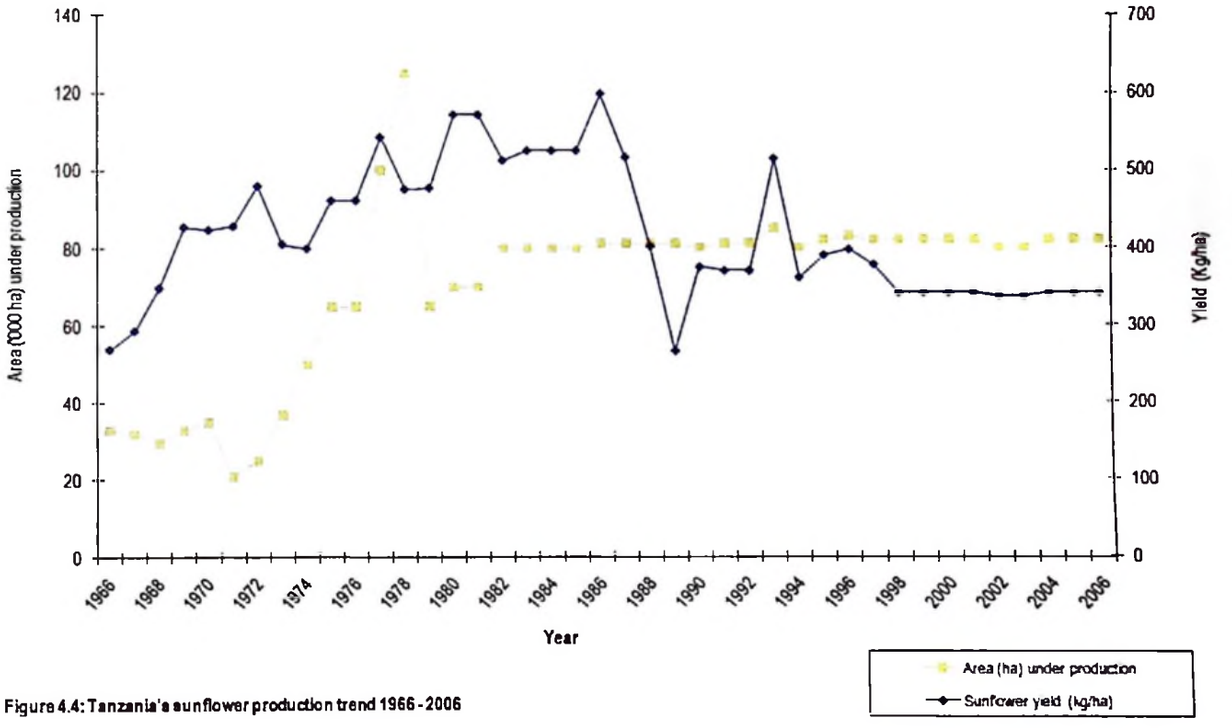


Figure 4.4: Tanzania's sunflower production trend 1966 - 2006

Source: The above graph has been constructed using data from FAOSTAT Online (November, 2009)

Tanzania's sunflower sub-sector is faced with a number of constraints, which include a lack of improved and sufficient seeds, forcing farmers to use their own seeds; unreliable market and low prices for sunflower seeds; diseases such as downy mildew; insect pests and other pests before and after germination; and inadequate improved tillage implements such as ox-plough or tractors. Other constraints are unreliable rainfall, inadequate knowledge of improved sunflower production techniques due to poor extension services, and stiff competition from edible oil imports (Mpagalile et al., 2008). According to Mpagalile et al., farmers' use of their own seeds is also caused by the high prices charged by stockists for high yielding varieties.

Tobacco production

Tobacco is one of Tanzania's major cash crops. According to BOT (2003) it's Tanzania's third largest foreign exchange earner after coffee and cashew nuts. BOT states that tobacco is the main source of income to some 72,000 smallholder farmers who are striving to get out or stay out of poverty. It offers employment opportunities both in tobacco farms and in the three processing factories in Morogoro and Ruvuma regions. In addition, the crop provides raw material for cigarette manufacturing factories, offering further employment opportunities in the country. Tanzania's tobacco is mainly grown on small and medium-scale subsistence farms in Tabora, Ruvuma, Shinyanga, Singida, Rukwa and Kagera; however, a few large-scale plantations or estates, such as those in Iringa and Mbeya, do exist where some Greek farmers have their own association, the Southern Highlands Tobacco Growers Association (SHTGA) (Masudi et al., 2001). According to Masindi et al., records suggest that tobacco was first introduced in Tanzania (Iringa) in 1938 by Britain's Overseas Food Corporation (OFC). However, it became more popular between 1945 and 1950 due to a rise in demand for tobacco on the world market. In its early days, tobacco was mainly grown by Greek farmers who were escaping political-economic hardships in Greece and Cyprus. The Greeks had also been attracted by the economic prospects of tobacco growing in Tanganyika due to assured general protection by the colonial government (Masudi et al.,).

Generally, tobacco requires curing before it can be sold. In Tanzania, two methods are used; curing by steam technology or flue-curing (mainly done by large farmers in Iringa, and Chunya) and curing by fire-heating technology (mainly done in Songea, Ruvuma and, Urambo, Tabora). A flue-cured (steam-dried) variety of tobacco was introduced in 1958 by the Tanganyika Agricultural Corporation, however only European farmers grew this at that time, and African farmers were only allowed to grow flue-cured tobacco in 1960 on condition that they sell the freshly plucked leaves to the company. Africans began curing the crop in 1962 after an exodus of European tobacco farmers (Masudi, et al.). The departure of British farmers in the early years of independence led to Tanzanians, who had been working on the British farms mostly as helpers or casual labour to start growing the crop, widely extending on family-based small holdings. After tobacco's early introduction to Iringa and Tabora regions in 1938 and 1945 respectively, production was later extended to other regions such as Shinyanga and Tanga, which had conducive climatic and soil conditions, by 1967 tobacco was one of the most strategically important export crops in Tanzania (Masudi et al., 2001).

Tobacco's importance to Tanzania's economy has been fluctuating. In 1997 it ranked fifth among the country's cash crop exports after coffee, cotton, cashew nuts and tea[59], in the 1998/99 crop season tobacco ranked third after coffee and cashew nuts, and fourth after coffee, cotton and tea during the 1999/2000 crop season[60]. According to BOT (1999) tobacco contributes about nine percent of the

[59] Bank of Tanzania [BOT] (1997: 70) cited by Masudi et al.,(2001)
[60] BOT (1 999) and MoAF (1999) cited by Masudi et al.

country's export earnings, between 2004 and 2009 tobacco has contributed over 340bl/- (Tsh) to government coffers, and the Tanzanian government is committed to increasing its production despite it being accused of causing some health problems (Kimati, 2009). The importance of tobacco production to Tanzania's economy was recently stressed in Tanzania's parliament by the deputy minister for Agriculture and Food Security David Matayo David, as shown in the quotation below.

> Nearly 85 per cent of tobacco produced in the country is exported, with only 15 per cent consumed locally. In the last season 2007/2008 the tobacco industry earned the country 90bn/- and the immediate plan is to help farmers increase production from 58,702 tonnes last season to 60,000 tonnes next season, 2009/2010. It is extremely difficult to reject one (tobacco) but appreciate the other (revenue), (Kimati, 2009-The Guardian Newspaper, 5th November 2009).

Generally, Figure 4.5 shows that both area (ha) under tobacco production and its yield have been increasing since 1966. However, breaking the period into two, the pre and post-agricultural reform periods show that whereas area under production increased between 1966 and 1985 tobacco yield declined (Appendix 4.7); however, in the post-reform period (1986 -2006) both area under production and yield increased (Appendix 4.8). The correlation between area under production and yield for the two periods was -0.239 and 0.241 respectively; both were statistically insignificant. However, the overall correlation (1966 – 2006) was 0.369 and this was significant (0.05 level). The increase in yield in the post-reform era may partly be explained by changes that occurred in the sector; private tobacco companies were involved in the procurement of tobacco directly from farmers; they also employed their own extension staff who concentrated on ensuring farmers adhered to the right husbandry practices; They loaned and continue to loan the necessary inputs to their clients, the costs are recovered when farmers sell their tobacco at the harvesting period. These factors together with the extension services offered may in part explain the rise in tobacco yields after liberalization of the agricultural sector relative to the decline recorded before.

However, despite the importance of tobacco production and its increase over time, tobacco growers in Tanzania are faced with various constraints which lead to low household incomes. According to Rweyemamu and Kimaro (2006) on the basis of a study conducted in Ruvuma region the constraints include pests and diseases; lack of adequate capital; unavailability of inputs; delayed supply of inputs; poor extension services; and high production costs. Rweyemamu and Kimaro also point out that farmers face some market-oriented constraints such as poor classification of their tobacco leaves, delayed payments, delayed/late procurement of tobacco, inadequate grading material and transportation problems.

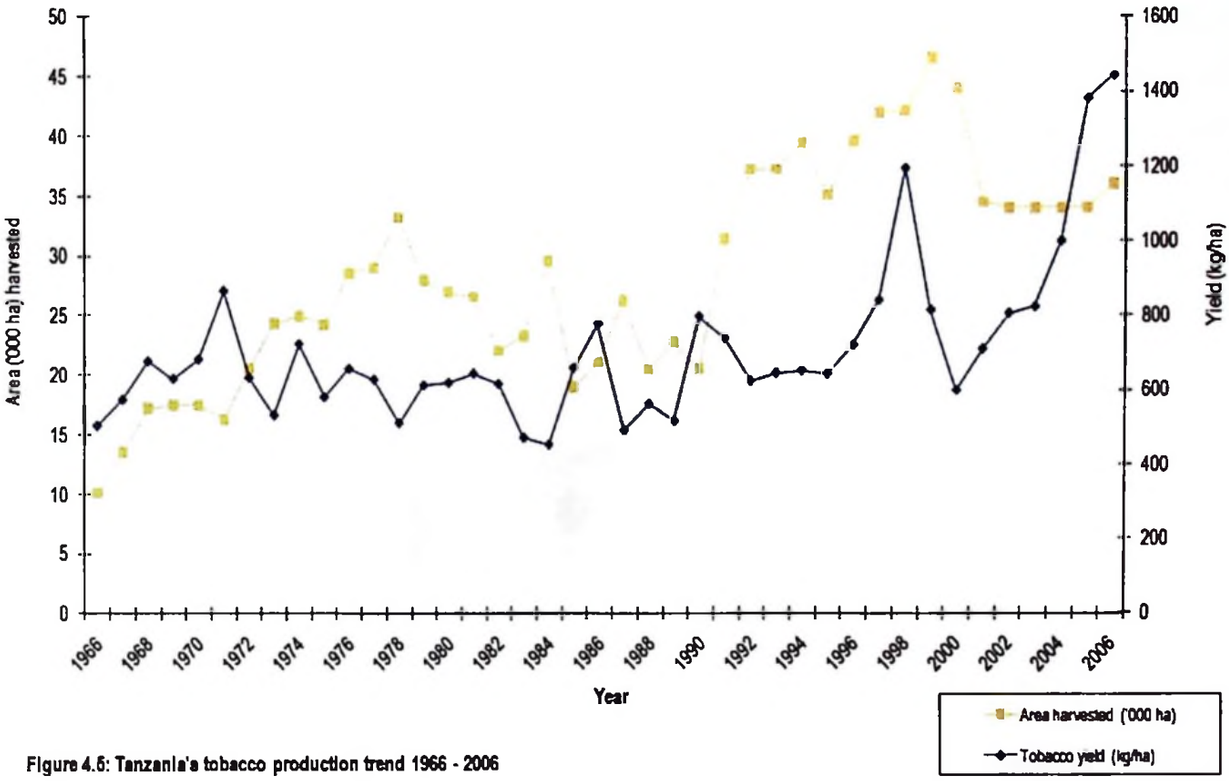


Figure 4.5: Tanzania's tobacco production trend 1966 - 2006

Source: The above graph has been constructed using data from FAOSTAT Online (November, 2009)

4.3 Maize production in Tanzania before and after liberalization of the maize market

This section mainly examines Tanzania's maize production before and after liberalization of the maize market in 1986, to enable a better understanding of how the sector has been performing after the liberalization of input and product markets. It is also a useful foundation for later chapters, which examine how farm households' maize production in Rukwa has responded to the liberalization of the agricultural sector and how this has contributed to rural well-being. Supporters of trade liberalization[61] predict that increased access to new technologies and improvements in the marketing situation may increase one's income and profits and lead to reduction of poverty. Skamstein (2005) points out that a key to deregulation of prices and adoption of free marketing for both inputs and output (crops) is having 'correct' input prices as well as 'correct' higher producer prices; these then motivate the producers to increase their production efficiency through more investment and higher land and labour productivity. The section gives a historical perspective on maize production in Tanzania, including production levels and trends before and after the liberalization of the maize market and factors affecting its production.

[61] (IMF Staff, 2001; McCulloch et al., 2001, Bannister and Thugge, 2001; Winters et al., 2002; Anderson, 2002; Grossman and Helpman, 1991 as cited by Harrison and Hanson,1999 and Winters et al., 2004; Coe et al., 1997 as cited by Winters et al., 2004; Edwards, 1998 cited by Harrison and Hanson, 1999; McCulloch et al., 2001 and Gisselquist and Harun-ar-Rashid as cited by Winters et al., 2002)

As pointed out earlier maize In Tanzania is not only a very important staple crop but also a source of income to many[62]; for example, Ashimogo (1997) reported that income from maize sales accounted for over one-third of total cash income in Sumbawanga district in Rukwa. Reports by Kaliba *et al.*, and Doss *et al.*, have also shown that in the lake zone (Kagera, Mara, Mwanza and Shinyanga) maize competes aggressively with cotton for land, labour and monetary investment by farmers due to its importance as a cash crop. RATES (2003) point out that about 85 % of Tanzanians depend on maize as an income-generating commodity.

According to NBS et al. (2006) maize is Tanzania's dominant annual crop, with a planted area that is 4.25 times that of cassava, the crop enjoying the second highest planted area. Maize constitutes 44 % of Tanzania's overall planted area and 72 % of that planted with cereals (NBS et al., 2006). Maize is grown in all the 21 regions of Tanzania mainland, although at different levels. NBS et al. report that the National Sample Census of Agriculture 2002/03 has shown that during the rainy season 3,096,707 households on Mainland Tanzania grew maize whereas 1,424, 672 did this in the short rains season. Tanzania's annual maize per capita consumption is 112.5 Kg, according to Food Security Department (FSD) (1992, 1996), cited by Mafuru *et al.* (1999) and Kaliba *et al.* (1998). Estimated annual national consumption is 3 million tonnes. Based on the National Food Balance Sheet, RATES (2003) provided a similar estimate. According to Bisanda *et al.*, (1998) it provides 60% of the dietary calories and more than 50% of utilizable protein for the Tanzanian population. Bisanda *et al.*, further point out that the crop occupies about 40 % of Tanzania's cultivated land area.

Despite the importance of maize as a staple food to most Tanzanians, it is mostly produced by small-scale farmers; and according to Katinila *et al.* (1998) and Bisanda *et al.* (1998) most of them own farm holdings of less than 10 ha. The crop's importance leads to it be equated to food security by many: it is quite common to hear people say 'I don't have food' meaning 'I don't have maize'. This belief reflects its importance as a source of dietary calories and utilizable protein to most of the Tanzanian population. A cheap supply of maize can also ensure urban households are able to divert their meagre incomes to other needs. The importance of maize as a source of income could be boosted even further if the sale of green maize[63] was allowed without continued interference by local authorities, as is normally the case. Unrestricted sale of green maize could enable many urban dwellers to self-employ themselves and reduce their poverty levels. Pioneer (2006) points out that even though the green maize market is opportunistic it offers 2 – 3 times the price of dried maize. In Tanzania local authority officials have been banning this

[62] Ashimogo, 1997; Bisanda *et al.*, 1998; Mafuru *et al.*, 1999; Kaliba *et al.*, 1998 and Doss *et al.*, 2003.
[63] This refers to maize harvested before it is dry, which is normally either boiled (*mahindi ya kuchemsha*) or roasted (*mahindi ya kuchoma*) and many people enjoy this as a snack. Local authorities or at times even the central government ban sale of green maize on the pretext that if not controlled it could lead to food insecurity. In fact to farmers the sale of green maize may be more profitable than selling dried maize.

trade on grounds that it threatens the food security of farmers. Increased production could cater for both the traditional dry maize sector and the green maize sector to the advantage of farmers.

On the basis of the above the current study and this chapter looks at the trend of maize production and its general role in rural households' well-being in the context of 20 years of agricultural reforms which includes the liberalization of the maize market in 1986. A thorough examination of the sector's performance in the liberalization era could enable those responsible for its promotion to better understand its productivity measured as yield per ha and determine what needs to be done to raise these levels even higher, to enable farmers earn more income. Increased productivity is particularly important for households that are mostly dependent on the crop as their main source of income and food, as it's only through higher productivity per ha that these households can reduce their poverty and further improve their living standards. The chapter analyses secondary data collected from five booklets containing Basic Data for Agriculture and the Livestock sectors of Tanzania are compiled from different regions of Tanzania by the Ministry of Agriculture. Data from FAOSTAT[64] accessed online is also used to show in particular the production trend between 1966 and 1986.

4.3.1 The historical background of Tanzania's maize production

This section examines when the crop was first introduced, its adoption by farmers and how it has currently become a major food source to more than 120 ethnic groups of Tanzania mainland. A historical perspective of anything allows one to understand how people come into contact with an idea or innovation, whether they were hostile or receptive and its future prospects. The whole study also benefits from the historical outlook as it enables an understanding of how maize as a food crop was received and continues to be important in the daily lives of Tanzanians, replacing some traditional staples, for example millet, in Rukwa region (URT et al., 2004).

Maize, according to Miracle (1966), cited by Ashimogo (1995) was first introduced in Tanzania (Tanganyika) in the seventeenth century, with its production mainly confined to coastal areas until the mid-nineteenth century. However, currently the crop is widely accepted by most if not all of the ethnic groups in the 21 regions of mainland Tanzania as a major food crop. For example the Haya (Kagera) and the Chagga (Kilimanjaro), whose traditional food crop was plantains, have got used over the years to production of maize both for food and trade. Mafuru *et al.* (1999) points out that the growing importance of maize as a food crop and cash crop has caused 90% of the residents of the Tarime highlands to grow it now even though it was only introduced there in the 1920s by the colonial administration. The importance

[64] According to FAOSTAT this data comes from official country estimates.

of maize in Tanzania's agriculture is also shown by its continued increase in production year after year (Figure 4.6).

Due to the importance of maize to Tanzania's food security the government has been engaging in various ways to promote its production. According to Katinila *et al.* (1998) research and extension efforts supporting maize production started in the 1960s and these led to the release of various cultivars like Ukiliguru Composite A (UCA) and Ilonga Composite White (ICW) through both human and financial resources. To help in developing the maize sector the Tanzanian government, with assistance from the United States of America Agency for International Development (USAID), set up the National Maize Research Programme (NMRP) in 1974 with the aim of developing cultivars suitable for major maize producing areas[65]. Other efforts to improve farmers' maize production include the "Kilimo/SG 2000" or "KSG 2000" project, which was a joint programme of SAA and Global 2000, which the Carter Center operated in association with the Ministry of Agriculture, Livestock Development and Cooperatives and implemented between 1989 and 2004. The project aimed at improving farmers' maize production and started with 67 maize management training plots (MTPs) of about 0.5 hectare each in the northern highlands[66]. Many other research projects geared towards improving maize production have been carried out in Tanzania, either focusing only on maize or as a part of wider projects, with both government and donor funding. A project on increasing food security and improving livelihoods through the promotion of integrated pest and soil management in lowland maize systems was implemented between 2002 and 2005 as a joint venture between DFID, NRI, SUA, and Ilonga Agricultural Research Institute. Another aimed at improving access to and management of disease resistant maize cultivars in the Southern Highlands was carried out by collaboration between DFID, NRI, Uyole Agricultural Research Station, INANDES Foundation and SUA from 2002 to 2005 (USAID-Tanzania, 2005).

It can be concluded that since maize was introduced to Tanzania in the seventeenth century its acceptance and production has been increasing year after year. Currently the crop is widely accepted by most if not all of the ethnic groups and regions of Tanzania mainland as a major food crop.

4.3.3 Maize production in Tanzania: levels and trends

This section examines levels and trends of maize production in Tanzania between 1983/84 and 2004/05. In some instances reference is also made to earlier periods, for example production in the 1960s. The examination enables an understanding of how maize production levels have been changing from just before the maize market liberalization in 1986 to 2004/05, the last cropping season for which data is available. Tanzania has been able to produce most of her maize requirements between the early 1960s

[65] Mafuru *et al.* 1999; Kaliba *et al.* 1998; Bisanda *et al.* 1998 and Nkonya *et al.* 1998.

[66] Between 1989 and 1998, 40,000 small-scale farmers and over 1,000 extension staff participated in MTPs (SAA, 2007). Through KSG 2000 smallholder farmers were able to realize average maize yields ranging from 4.5 to 5.1 ton/ha—compared with the national average yield of around 1.3 ton/ha.

and the 1990s. According to Ashimogo (1995) the sufficiency ratio ranged between 95.7% between 1961/62 to 1973/74 and 99.9% between the 1984/85 and 1992/93 periods, with the overall sufficiency ratio for the whole period being 96.4%. According to Grepperud *et al.* (1999), Tanzania was a net importer of maize during the 1980s; however, in the late 1980s she became self-sufficient. According to Skarnstein (2005) Tanzania imported an annual average of 105,800 tonnes of maize between 1972 and 1986 due to stagnation of the agricultural sector. The need to import cereals including maize from abroad recurs now and then due to insufficient production to cover needs; for example in 2006 the government had to allow the importation of 300,000 tonnes of maize (Kimati, 2006). An FAO study reported by Tindwa (2008) shows that between 1980 and 2003 maize imports in Tanzania fluctuated widely between 12,879 and 298,921 tonnes. According to USAID-Tanzania (2005) the average maize yield has been 1.4 tons per hectare; they add that maize production grew on average by 2.4% between 1985 and 2000, significantly below the average population growth rate. On the other hand MAFC (2005), citing the Food Security Department, points out that Tanzania's annual maize production has hardly exceeded 3.0 million tonnes for the past ten years, a fact mainly attributed to adverse weather conditions.

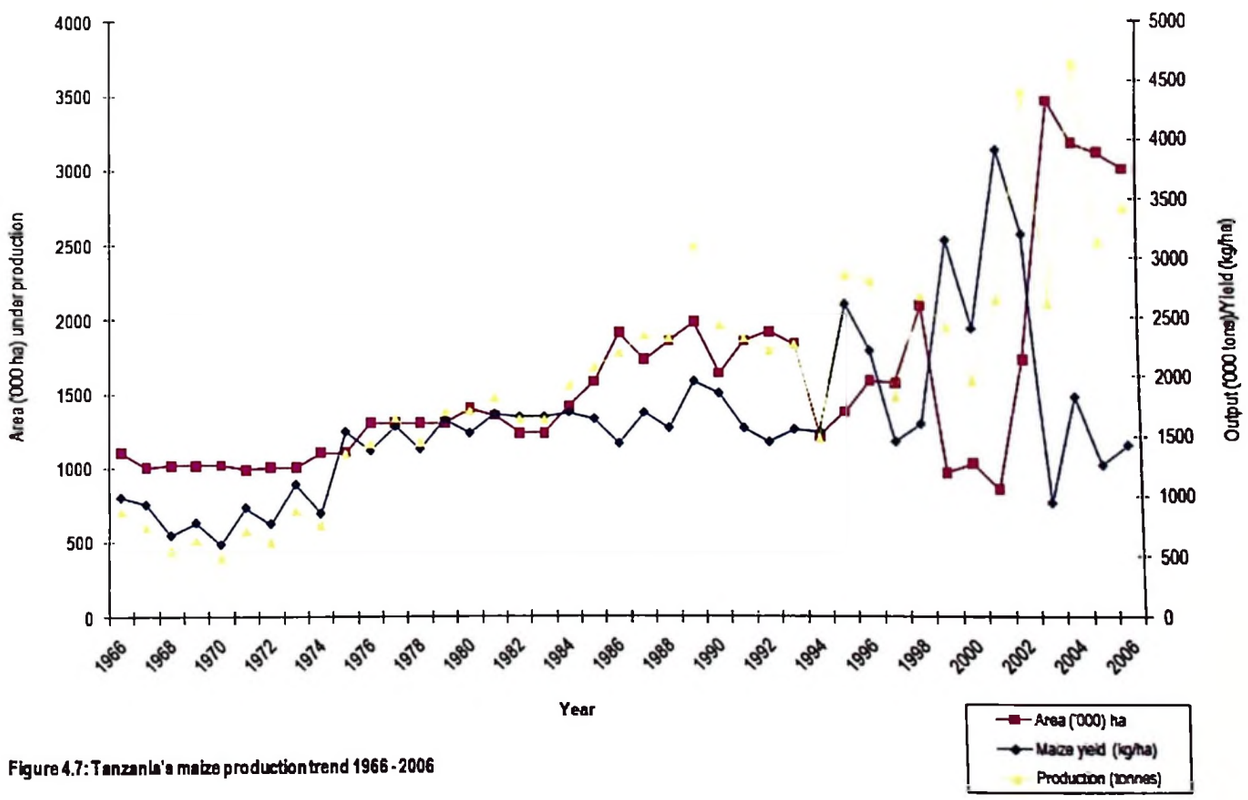


Figure 4.7: Tanzania's maize production trend 1966 - 2006

Source: The above graph has been constructed using data from FAOSTAT Online (November, 2009)

Figure 4.7 shows the dominance of both in the category of preferred cereals and the general cereals category. Generally, the Figure shows that maize has formed about 80 and 55 percent respectively of these two categories between 1962 and 2004/05, In Rukwa, the current study's area of concern, available data shows that about two thirds of farming land was allocated to maize production between 1983/84 and 2004/05, about three times more than that allocated to millet, the original staple crop of Rukwa (Appendix

4.9). These observations strongly indicate that for the purposes of Tanzania's food security efforts need to be taken to ensure that farmers' maize productivity is increased. Such a commitment will ensure not only stable and affordable supplies to urban areas but also rural food security.

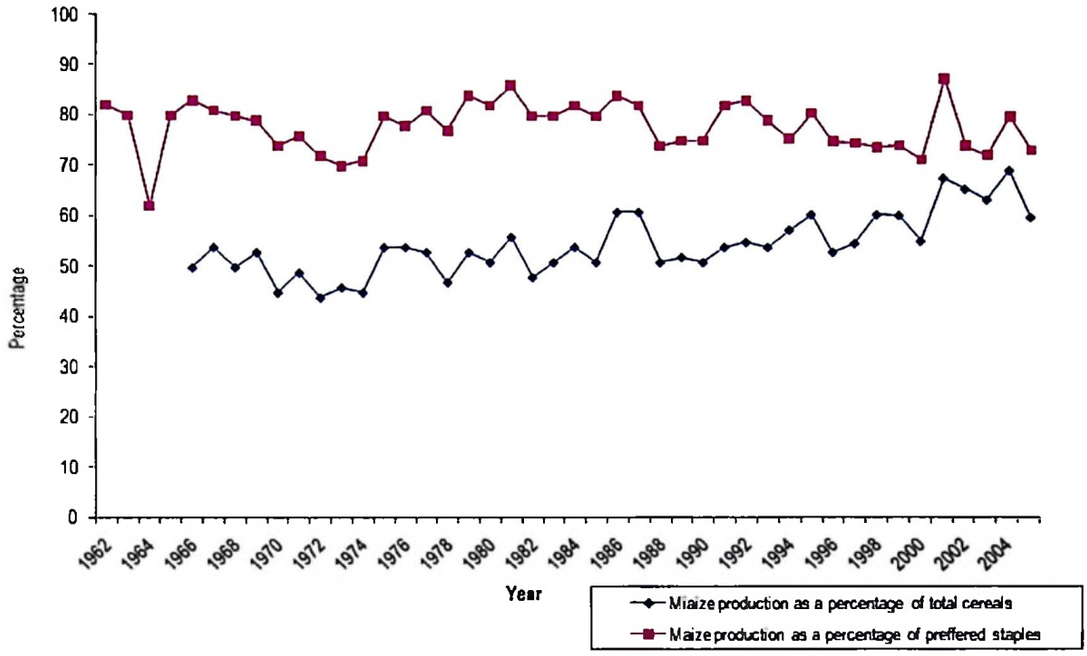


Figure 4.7: Maize as a proportion of total cereals and prefered staples, 1962 - 2005

Source: The graph has been constructed using data adapted from Ashimogo (1995: Appendix 2.2: 313) for the period 1962 – 1982/83 and the basic data for Agricultural Sector booklets covering the periods 1983/84-1987/88, 1986/87-1991/92, 1993/94-1999/2000, 1995/96-2002/03 and 1998/99 – 2004/05. The data is compiled by the statistics unit of the Ministry of Agriculture/ Ministry of Agriculture and Food Security

Generally, Figure 4.6 shows both amount of land under maize production and output have been increasing since 1966. Observations from the study generally show that increase in land under maize production between 1996 and 2006 was relatively matched with an increase in yield too. However, dividing the period into two (1966 -1885 and 1986/87 – 2004/05) shows noticeable differences between land under production and maize yield (Appendix 4.13 and 4.14). A correlation analysis of annual average yield with annual area planted with maize while significant (0.01 level) and positive (0.842) for the 1966 – 1985 period it was negative (-0.299) and significant (0.01 level) for the 1986 – 2006. Therefore, it could be concluded that increases in land allocated to maize production were not matched by increases in yield in the post-reform period. Additionally, an examination of the correlation between output and area under production, though positive in both periods shows a small decline in magnitude during the 1986/87 - 2004/05 period; the correlations from the two periods were 0.973 and 0.835 respectively.

According to MAFC (2007) Tanzania has 10 farming systems but maize cultivation is seen to be suited to only five (Appendix 4.10). According to the Appendix maize is not a major crop in four of the ten farming systems, namely the banana/coffee/horticulture system, the cashew/coconut/cassava system, the wet rice

and irrigated system and the pastoralist and agro-pastoralist system. In reality it is quite common for farmers in these systems to grow maize even when its performance is not satisfactory, for example in the arid and semi-arid areas of Tanzania (Appendix 4.11). However, when these areas receive more than average rainfall range, maize performs very well, and this may be the reason that attracts them to plant maize every year in case of a good outcome. Although maize is currently grown in all the 21 regions of mainland Tanzania, acreage cultivated and productivity varies across the regions (Appendix 4.12). According to the 2002/03 National Sample Census of Agriculture as reported by NBS et al. (2006), Shinyanga region has the largest planted area of maize followed by Dodoma, Tanga, Tabora and Mbeya respectively. Mwanza, Tanga, Dodoma, Shinyanga, and Kilimanjaro regions had the highest proportion of land with maize whereas Lindi had the lowest. Dodoma, Manyara, and Shinyanga had the largest area planted with maize per household, while Morogoro, Pwani and Ruvuma, Kagera, Kigoma and Dar es Salaam had moderate and smallest planted areas respectively (Appendix 4.12).

As observed in Figure 4.6 and Appendices 4.13 and 4.14, despite the general increase in maize output Tanzania's maize production has not been a smooth upward process but one of ups and downs; for example between 1989 and 2005 the fluctuation in output and yield is quite evident. The ups and downs may not be adequately explained by the current study due to data limitations, but some of the factors are discussed in detail in section 4.4, on the basis of available data. Some further insights for the ups and downs are explained in Chapter Six, which examines Rukwa's maize production in detail.

4.3.3 Factors affecting maize production in Tanzania

A number of factors have been affecting Tanzania's maize production and may continue to affect it if action is not taken. The overall increase of total maize production before and after 1986 has mainly been due to an increase in land under maize production rather than increases in productivity. Nevertheless, the contribution of big harvests in some years (Figure 4.6) cannot be ignored. The general rises and declines in maize production (Figure 4.6) can be explained in various ways. Some factors are related to the access to inputs (e.g. fertilizers, seeds, pesticides); others to price variation, climate, crop husbandry practices, and farm households' socio-economic characteristics. The negative effect of liberalization of Tanzania's agricultural sector, especially on the maize sector, is discussed in detail below but the effects of the other mentioned factors will be dealt with briefly; as detailed explanations are offered in Chapter six.

Access to inputs by maize farmers is one of the major constraints that have been highlighted in literature. According to literature access to inputs by farm households has been quite challenging following liberalization of the input markets and that this has led to a decline in productivity of some crops[67]. For example Skarnstein (2005) strongly believes liberalization of the input sector is a cause of the decreased

[67] Hawasi *et al.*, 1999; Ashimogo and Mbiha, 2000; Meertens, 2000; URT et al., 2001; Dos et al., 2003 and Skarnstein 2005.

chemical fertilizer use currently being experienced in Tanzania. Skarnstein adds that the decrease in average maize yields (Kg/ha) and low labour productivity have no correlation whatsoever with changes of rainfall, either over time or with respect to regional patterns as claimed by MAFC (2007) and USAID-Tanzania (2005). According to Skarnstein most of Tanzania's chemical fertilizers are used in the maize, tobacco, coffee and cotton growing areas, but, liberalization has led to changes in the amounts used for each crop and even within regions. Citing the World Bank (2000) and other authors[68], Skarnstein points out that the lowest quantities of fertilizer consumption since 1973 have been reported after the 1986 SAPs[69] and that this has been the cause of the decline in productivity (Kg/ha). Skarnstein further argues that in addition to causing the decline in total fertilizer consumption, reforms of the input markets have also caused a sharp shift of fertilizer use away from typical maize-growing regions, especially in the Southern Highlands (Iringa, Mbeya, Ruvuma and Rukwa) to typical tobacco-growing areas. Citing MAC (2000) Skarnstein points out that whereas Iringa and Ruvuma consumed almost 65,000 tonnes of fertilizer in 1990/91 they only used 20,000 tonnes in 1998/99. In contrast in Tabora, a predominant tobacco growing area, fertilizer consumption rose from less than 18,000 tonnes in 1990/91 to 31,000 tonnes in 1998/99. Due to liberalization the decline in fertilizer use, according to Skarnstein, has led to a decline in maize production in some of the more remote regions of the southern highlands (Mbeya, Rukwa and Ruvuma), while expansion is occurring in Iringa, Dodoma and other regions closer to Dar' es Salaam WB, (2000) cited by Skarnstein, (2005).

The 1980 SAPs led to the closure of the Tanzania Fertilizer Company (TFC), Tanzania's only fertilizer company, in the late 1980s. Before 1991 TFC was the sole producer, importer and distributor of fertilizer in Tanzania (Majule, 2004). The closure of the Tanga-based factory led to total reliance on foreign imports which were relatively expensive for ordinary small-scale farmers due to lack of government subsidies offered before the 1980s SAPs. According to Majule the liberalization of fertilizer importation in 1991 and the gradual removal of government subsidies led to a decline in chemical fertilizer use from nearly 140,000 tones to about 60,000 in 1998/99. A smaller supply of fertilizers has caused prices to be high, denying poorly resourced farmers' access to it. A survey of farmers in the 1997/98 cropping season showed that decreasing fertilizer use has been due to high prices; 39.1% of the respondents said they were not using fertilizer due it being too expensive[70].

Tanzania's average use of chemical fertilizers per farmer currently stands at an average of 8 kilograms per hectare, compared with an average of 578 kilograms per hectare used by farmers in a rich country like the Netherlands (Kikwete, 2007). According to the WB (2007) Tanzania has also experienced a decline in the percentage of households using inorganic fertilizer from about 23 percent in 1994 to about 9 percent in

---

[68] WB, 1994; Hawasii *et al.*, 1999; WB, 2000; MAC, 2000 and MAC/NBS, 2000.
[69] The effect of low fertilizer use due to removal of subsidies following liberalization, resulting in low maize output has been reported by Hawasii et al., 1999 and the WB, 2000 as cited by Skarnstein.
[70] Integrated Agricultural Survey of 1997/98 (MAC/NBS, 2000:73); cited by Skarnstein, 2005.

2003, with most of the reduction occurring between 1994 and 1998. The WB concludes that rainfall remains the major barrier to increased maize productivity even though about 77 percent of annual crops are planted without fertilizer. The decline in chemical fertilizer use is partly blamed on un-affordability and lack of access particularly in some rural areas (Skarnstein, 2005). The expensiveness of chemical fertilizers even by international standards has also been noted by the government (URT, 2000, cited by Majule, 2004). After the liberalization of the agricultural sector the price of inputs including fertilizers has been a greater obstacle to farmers' production than other factors like distance to access inputs. The 2002/03 agricultural census shows that the cost factor is a greater impediment to use of inorganic fertilizers than distance or local availability, as only 18% of the responding households mentioned 'non availability 'to be a problem compared to 57% who reported cost to be a barrier. NBS et al. (2006) assumes that had the cost of fertilizer been affordable many smallholder farmers would have had easy access regardless of the distance factor reported above. Nevertheless, the decline in fertilizer use particularly on foods crops may only be true for some regions since its use was not the same in all the regions at all times[71].

Reforms of the input markets have also affected the use of other inputs like pesticides, insecticides and improved seed, including improved maize seed. Although the use of these varies across Tanzania, liberalization of the input supply coupled with the withdrawal of government subsidies has rendered these expensive. Some farmers only use insecticides and pesticides when the infestation is so high that they must use them, otherwise some take infestation for granted leading to loss of valuable production[72]. The use of improved maize seeds, according to empirical evidence, has also gone down following Tanzania's liberalization of the agricultural sector, leading to increased recycling of hybrid seeds, and reduced production per ha due to loss of hybrid vigour[73]. The high prices of pesticides and insecticides also mean pests and diseases cannot be effectively controlled, reducing not only farm households' maize production per ha but also their total production. This situation damages households' food security and even the fight against poverty, which liberalization of the agricultural sector aimed at in 1986.

Other factors related to the liberalization of the agricultural sector that affect Tanzania's maize production include the abolition of pan territorial prices on both inputs and agricultural outputs. Skarnstein (2005) reports that the abolition was responsible for the shift in fertilizer use that occurred in the Southern

---

[71] According to Meindertsma (www.icra-edu.org) Tanzania has always experienced a strong concentration of fertilizer use in certain regions. In the 1970s its use was high in the nine regions of the Southern and Northern Highlands, which in total consumed 69% of all chemical fertilizers. This amount rose to 82% in the second half of the 1980s and to 90% in the first half of the 1990s. Meindertsma citing Agricultural Input Study (1997), points out that liberalization of the fertilizer sector has further concentrated use of chemical fertilizers in the same regions, with other regions of mainland Tanzania put together accounting for less than 8% of all fertilizer use.

[72] Mduruma et. al. (1988), cited by Bisanda et al. (1998) points out that plants infected with Maize Streak Virus (MSV) within a week after germination produce no yields, while infection occurring at three weeks after germination leads to farmers harvesting half the potential yield. Lyimo and Temu (1992), cited by Bisanda et. al. (1998), report that pests such as stalk borers can lead to losses as high as 20%.

[73] Matowo and Mgema (1990), cited by Nkonya *et al.*, 1998; Mafuru *et al.*, 1999 and Doss *et al.*, 2003

Highlands, whose previous consumption stood at more than 50% of the total consumption. This caused fertilizer to become more expensive in more remote areas, making maize production unprofitable. On the other hand the removal of the pan territorial prices on output caused farm households to face price uncertainties. Whereas high maize prices can be a good stimulus for farmers, increasingly low prices can lead them to reduce production (Figure 4.8). Correlation analysis results (Appendix 4.15) have shown that average maize wholesale price was significantly (0.05 level) correlated to maize production and area allocated to its production between 1989/90 and 2003/04. The influence of high maize prices on production has also been reported by Bilame (1999), cited by Skarnstein, who states that real producer prices before Tanzania's deregulation were positively correlated to maize production; however after deregulation these were negatively correlated. High prices after liberalization reflected deficient supplies whereas low prices indicated bumper harvests. Skarnstein argues that Tanzania risks stagnation of her maize production if there continues to be a lack of price stabilization measures and resultant strong price volatility.

Tanzania's liberalization of the agricultural sector and consequent transition from a single-tier to a multi-tier agricultural marketing system, which also involved the withdrawal of input and transport subsidies, is also blamed for sharp declines in the profitability of smallholder cultivation of maize, especially in the south-western areas. Skarnstein argues that this has caused a gradual shift of maize production to northern Tanzania where the soils are more fertile, allowing cultivation with less dependence on chemical inputs. Skarnstein is supported by Maghimbi (2007) who reported households in Kilimanjaro to be foregoing production of coffee, a long established cash crop in the region, for maize and rice production. The northern regions also have the advantage of easy access to national markets due to their good road network. This has in turn resulted in an agricultural depression in the south-eastern highlands of Rukwa and Ruvuma. Skarnstein adds that this process is reinforced by the fact that private traders, due to high transport costs, do not find it profitable to collect maize in remote areas, especially in Mbeya, Rukwa and Ruvuma.

Apart from the access to inputs and input and output-related constraints maize farmers are also constrained by climate-related constraints. The MAFC (2007) and USAID-Tanzania (2005) single out adverse weather conditions as the major cause of Tanzania's decline in maize yields. Although Skarnstein (2005) disputes this and blames the decline on market reforms, a correlation analysis of rainfall versus maize yields for Rukwa using data from 1983/84 to 2004/05[74] (Appendices 4.17 and 4.18) shows yield was positively and significantly associated with rainfall, supporting the claim by MAFC and USAID-Tanzania. This observation nonetheless does not diminish the use influence of use of modern

[74] The rainfall data for Rukwa was collected from Tanzania Meteorological Agency (TMA) and is based on the average of four stations.

technologies on higher yields as empirical evidence[75] shows that use of chemical fertilizers and improved seeds are crucial for higher maize yields.

Other factors like those related to husbandry, diseases and pests and that of climate/weather have been presented in detail by Bisanda *et al.* (1998), and SAA 2007[76]; Mduruma *et al.* 1998[77]; USAID-Tanzania (2005) and MACF (2007)[78] respectively. Liberalization of the agricultural sector, and particularly the input sector, has contributed significantly to reduced maize production per ha. Other factors affecting production and productivity per ha are changes in the rainfall pattern in the various maize producing areas, farm households' socio-economic characteristics and general husbandry practices.

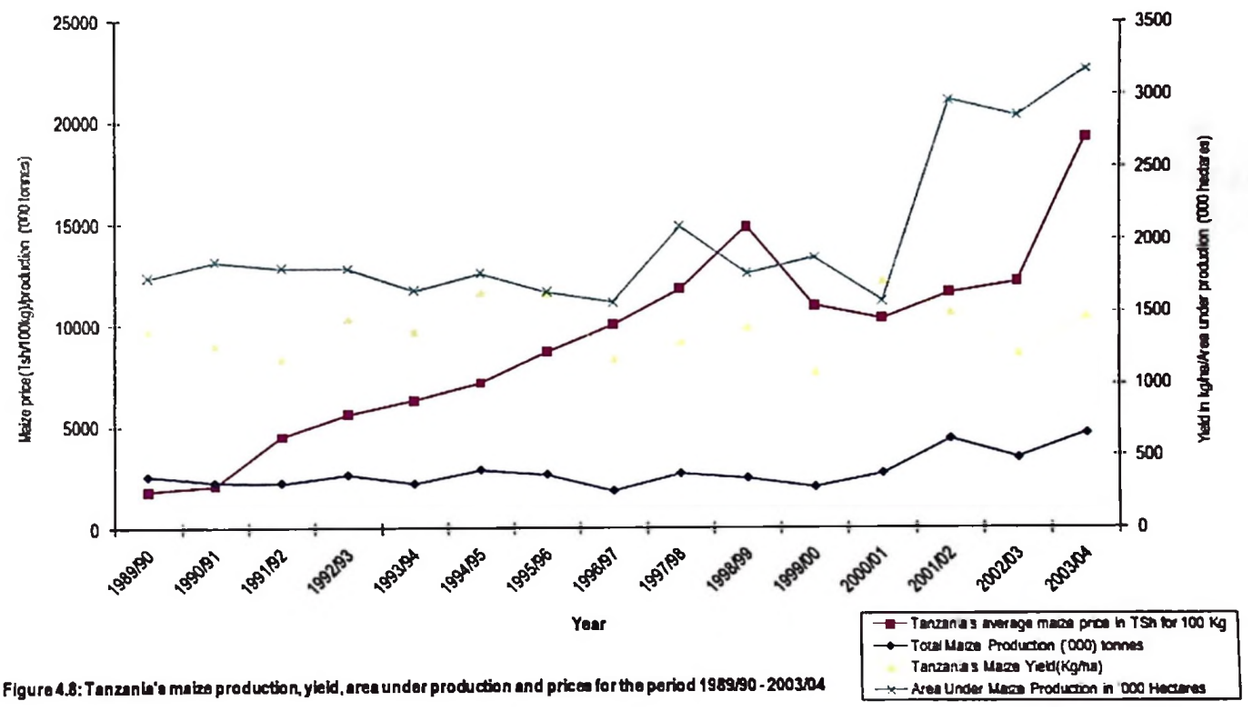


Figure 4.8: Tanzania's maize production, yield, area under production and prices for the period 1989/90 - 2003/04

4.3 Conclusions

The chapter has shown that agriculture in Tanzania remains an important integral part of the economy; whereby the sector accounts for about half of the national income and three quarters of merchandise exports. It is also the major source of food, and provides employment opportunities to about 80 percent of Tanzanians (URT, 2004). The chapter has shown that Tanzania's agriculture is mainly dominated by food crop production that is highly dependent on rainfall. After an overview of Tanzania's agriculture by looking at reforms introduced into the sector since independence and thereafter it examined production of six

[75] Matowo and Mgema (1990), cited by Nkonya *et al.*, 1998; Mafuru *et al.*, 1999; Doss *et al.*, 2003, Hawasii et al., 1999 and the WB, 2000 as cited by Skarnstein.

[76] Bisanda et al., (1998) and SAA, 2007 present detailed arguments for the ability of application of fertilizers to increase maize productivity per ha. SAA (2007) further point out the importance of extension services in raising maize productivity per ha. Bisanda et al. give details of the effect of late weeding on productivity/ha.

[77] Mduruma et al., (1998) points out the influence of pests/diseases like maize streak virus on maize yield.

[78] USAID-Tanzania (2005) and MACF (2008) argue for the important role of rainfall on Tanzania's maize production

crops; maize, rice, beans (food crops) and groundnuts, sunflower and tobacco (cash crops). During the study these were the most important crops according to the respondents, and they were also examined at the national level to get a better understanding of observations from the study which are presented in Chapter Six. Maize, rice and beans are important crops in relation to Tanzania's food security. Five of the crops were only looked at briefly, and maize was examined in a more detailed way because of its huge contribution to Tanzania's food security and its role as a source of livelihood to millions of Tanzanians.

The chapter has examined maize production before and after the liberalization of the maize markets in 1986 by the Tanzania government, including the history of the crop, its production trends, and factors that have affected its production and productivity. Since the introduction of maize to Tanzania its acceptance as a food crop has been increasing and it now is the food crop most preferred by a majority of the population. Maize has also shown abundant potential as a cash crop for farm households, so most households allocate about half of their farming land (ha) to its production. While the amount of land allocated to maize production has been increasing, its productivity per unit of land has been declining since the liberalization of the maize market, partly due to liberalization of the agricultural sector especially the input sector. Liberalization has caused a rise in the prices of inputs like chemical fertilizers, improved maize seeds, insecticides and pesticides, all of which are very necessary for raising maize productivity. The removal of pan-territorial prices on both inputs and the maize crop has damaged the maize sector, causing a decline in productivity and a shift of maize production between regions within Tanzania depending on its profitability. Other factors affecting the production of maize in Tanzania include rainfall, social-economic characteristics, and pests and diseases. Literature cited in the chapter indicates a window of opportunity for increasing farmers' productivity so that farmers engaged in maize production can improve their well-being. The point is further discussed in Chapter Eight. And Chapter Six reports on the production and yield levels of the six crops covered by this chapter and in Chapter Seven the role of maize in the well-being of rural households in Rukwa is examined.

Generally, the present chapter has shown that farm households engaged in the production of maize, beans, rice, groundnuts, sunflower and tobacco face various constraints, including drought; flash flood in rained lowland (or inland swamp) areas because of irregular weather; weed infestation, for example red rice in the irrigated schemes; inadequate and irregular input supplies: seeds, fertilizer, and credit; lack of small farm equipment, especially for post harvest operations; lack of effective farmers' organizations and cooperatives; poor maintenance of irrigation facilities; and a lack of well-defined policies. Others are poor road networks and marketing systems, labour shortage because of competition from other crops and weak research and extension support. The above constraints may also be applicable to the broader crop sector and thus efforts may need to be undertaken by the relevant authorities if rural households are to have satisfactory levels of well-being.

Chapter Five

Diversification of households' livelihood strategies

5.0 Introduction

Chapter Two (section 2.2) has shown that rural households make a living from a diversity of livelihood strategies (LS). The thesis in this chapter examines the nature of both on farm and off-farm diversification among farm households, in the context of 20 years of agricultural and other socio-economic reforms. The aim is to establish how important staples (i.e. maize) are to the farm and household LS, and how LS vary across key farm and household characteristics. The chapter explores the nature of LS among households and analyses factors associated with different LS. A number of hypotheses will be examined, such as whether diversification represents a strategy of households to spread risk but prevents them from specializing in a high risk/high return activities, or whether the opposite is the case suggesting that diversification is associated with commercial operations. Generally, the extent and nature of diversification of a household's income sources varies between households[79]. For example Ellis and Allison, 2004 argue that while better-off households tend to diversify in the form of non-farm business activities such as trade, transport, shop-keeping and brick-making the poor tend to diversify in the form of casual wage work, especially on other farms. They add that diversification by the poor tends to leave them still highly reliant on agriculture relative to the better-off whose dependence is reduced. The links between LS and poverty/well-being are explained in Chapter Seven. Literature also shows that crop diversification is higher among poor rural households than better-off rural households and it is argued that the cause of this may be the tendency of poor rural households to try growing a variety of crops to meet their household needs, whereas richer households tend to specialize their production by growing fewer crops.

There is a general debate concerning the influence of a farm household's farm size and farm fragmentation, and its diversification of both livelihood activities and crops grown[80]. As hinted in Chapter Two (section 2.3.1) there is a general expectation that farmers with larger farms would be more likely to diversify by moving out of agriculture (in case of activities requiring collateral) or even being able to adopt new crops. Blarel et al., (1992) have pointed out that land fragmentation could be beneficial to farmers by enabling them to manage risk, in overcoming seasonal labour shortages, and in better matching soil types with necessary food crops, whereas Block and Webb (2001) have reported on the lack of a strong positive association between the number of farm plots owned and crop share of income. Therefore, the chapter examines how farm size and its fragmentation are related to both households' diversification of their livelihood strategies and the crops they grew. As well as farm distribution and ownership structures, there are a number of other factors that may affect the relationship between farm size and diversification, some of which will be explored in this chapter. Firstly, in the context of migration from rural to urban areas

[79] Abdulai and CroleRees 2001; Block and Webb, 2001; and Ellis and Allison, 2004
[80] Blarel et al., 1992; Immink and Alarcón, 1992; Block and Webb 2001; Ellis, 2005 and Hazel et al., 2007.

particularly of young, better educated, males, there is a view that the remaining older, less well educated and female farmers may be less able to diversify, leading to increased exposure to risks and lower food security. This chapter addresses these issues by exploring how diversification patterns vary across age groups, education levels and gender.

The influence of age on crop production and choice of crops grown has been reported by many (Altmana et al., 1998; Abdulai and CroleRees, 2001; Iwanaga, 2001 and Minot et al., 2006). For example Abdulai and CroleRees have shown that age influences participation in the production of certain crops; reporting from their Mali case study they point out that farmers' likelihood of participation in cotton production first rose with age, and peaked at 41 years when it then declined. Altmana et al., report a positive correlation between age of surveyed farmers and the intention to grow tobacco. Hence there is some evidence that age is associated with growing cash crops, although the exact nature of the relationship remains unclear from these two studies. The Mali case-study suggests that there is an inverted U shaped relationship between age and growing cotton, whereas the study of North Carolina (USA) by Altmana et al., suggests a more linear relationship between age and growing tobacco. This is an interesting issue for the Tanzanian context given the high levels of tobacco production in one of the districts surveyed.

The chapter will also determine the influence of a households head's gender on its crop diversification; gender stereotyping may mean that we will observe differences in livelihood strategies between male headed households (MHHs) and female headed households (FHHs). Literature often refers to gender stereotyping of farm activities whereby women are involved in food production and men in cash crops, or different types of livestock. Ellis and Allison (2004) argue that women in Sub-Saharan Africa are disadvantaged in regard to land access and livelihood diversification. They point out that in Sub-Saharan Africa male migration and male non-farm work opportunities are more prevalent than those for female, leading to women being left behind. They add that female headed households in the region tend to be those of widowed or divorced women, and often make the bulk of the poorest households; in some rural societies both widows and divorcees lose land access and control rights due to immediate reclamation by the male side of the family. In Tanzania, FHHs, particularly those in rural areas, find themselves disadvantaged with regard to ownership, access and control over land and also opportunities for diversifying their LS. Section 5.5.4 highlights the differences between FHHs and MHHs in relation to diversification of LS. Some of the differences caused by a lack of other employment opportunities, either due to lack of education/skills or gender stereotyping of roles. The ability of FHHs to secure credit with which to start some meaningful trade is also limited due to a lack of credit providers in the rural areas.

The chapter further examines the influence of a household's head's education on crop diversification. The influence of education on a household's/individual's choice of a livelihood strategy is widely reported in

literature[81]. Just as education influences the choice of individual or household LS it may also influence a household's choice of crops, what to be cultivated, how much land to be allocated and thus, a household's crop diversification. Davis et al. (2007) argue that despite the importance of investment in education and its expected positive returns on the income of rural households, the benefits of schooling will not be uniform across all income generating activities. They point out that increased schooling may not only have a differential impact on the return to certain activities but also lead to a shift between activities. According to Taylor and Yunez-Naude (2000) cited in Davis et al. experience from rural Mexico shows that schooling links rural households to new income sources, such as local waged work, and shifts households out of staple crop production and towards cash crops and waged employment. Most of Tanzania's adult population has an education level of 5 – 8 years of formal schooling (URT, 2007). Despite some marginal improvement in the levels of education since the introduction of universal primary education (UPE)[82] in the 1970s, the proportion of the adult population with some secondary education or above is only about 10 percent while those with no education or with less than 5 years of formal schooling comprise slightly over a third.

The chapter also aims to determine the influence of households' location on their diversification of crops and LS. The geographic location of households has an important bearing on to whether the household can access off-farm income generating opportunities, for example formal employment in either the public or private sector (Immink and Alarcón, 1992). Ones locality can also determine what type of trade opportunities are available and what type of crops a household could grow to enhance income earning capabilities. For example Abdulai and CroleRees (2001) have reported that households situated closer to local markets are more likely to participate in non-food production activities compared to those in remote areas. They argue that superior access to markets can enable households to overcome market constraints, therefore increasing ability to develop private marketing initiatives which then enable them to shift producer resources into diversification activities. Davis et al. also point out that greater access to infrastructure (electricity, water, communication, roads and other forms of infrastructure) and a closer proximity to urban centres could enable a broader range of opportunities compared to those with less access, who may be limited to agricultural activities. They state that access to infrastructure could lead to greater returns to crop and livestock activities, presumably due to better access to markets. The three districts used in this study vary in their accessibility to major markets particularly due to a difference in transport infrastructure; Mpanda is more remote. However, Mpanda is connected via Tabora to the central rail line running from Kigoma to Dar es Salaam. The rail as a means of transport is less accessible by the other two districts and anyone wanting to transport cargo using this mode of transport has to first transfer it

---

[81] Unni, 1996; Winters et al., 2001; Abdulai and CroleRees, 2001; Marzano, 2002 and Galab et al., 2006, Davis et al., 2007.

[82] Free UPE was briefly halted at the end of the 1990s following the introduction of cost sharing in education and the health services sectors following the SAPs of the 1980s, a nominal fee of Tsh 2,000 (about 1£) per year was charged per pupil beginning in 1995 (Terme, 2002). According to Wedgwood (2007) introduction of fees in primary schools led to less than 60% of primary school-aged children being in schools by the end of the 20th century.

by trucks using an unpaved road to Mpanda, more than 100 miles away. The three districts also have some significant agro-climatic differences (see section 3.1 and Appendix 3.0).

It's the thesis aim to also examine the influence of a household's size on its crop and LS diversification. Generally, it is expected that large sized rural households would be able to diversify both their crop production and livelihood strategies easily due to abundance of their own labour. This observation is supported by Immink and Alarcón, (1992) who argue that farm households with labour constraints find themselves unable to diversify beyond a few activities. In section 5.5.4 the thesis explores whether farmers with larger households and presumably surplus labour are indeed able to support a greater range of activities both on and off-farm. Tanzania's average household size varies among the regions; for example according to the 2002 census it ranged between 4.1 (Lindi) and 6.9 (Kigoma), the national average for Tanzania mainland was 4.9. In the study area some variations also existed; whereas the regional average stood at 4.9, the averages for the three districts were 4.9 (Sumbawanga), 5.0 (Nkansi) and 5.6 (Mpanda) (URT, 2002).

The above hypotheses will be explored at two levels. First the chapter examines on-farm crop diversification aiming at understanding how maize, the chief food staple, fits into farmers' crop diversification strategies. Secondly, the chapter moves to a higher level of aggregation by exploring farmers overall diversification, broadening the analysis to look at other farm activities such as livestock, and off-farm and non-farm activities such as waged labour and trading. To achieve the above a combination of qualitative and quantitative evidence is used. The chapter draws on data from the focus group discussions on what the most important crops and activities are for households, and how this may vary across districts and households, and also uses data from the survey to shed light on the diversification strategies adopted by individual households. The statistical analysis uses summary statistics, correlation analysis and ANOVA, the aim of the last two is to check for statistically significant associations between diversification and household characteristics such as household's head's age, sex, education, farm size and fragmentation, district of residence and income.

Section 5.1 presents the conceptual framework for diversification of households' crop and livelihood strategies and section 5.2 examines crop diversification by households. In section 5.3 the chapter examines the relationship between households' farm holding size and its fragmentation and crop diversification, a particular emphasis is put on maize. In section 5.4 the chapter examines crop diversification on the basis of percentage of land dedicated to maize production relative to both other food and cash crops, the relationship between the age of a household and crop diversification, and crop diversification related to gender, education level of the household's head and income levels. Lastly, section 5.5 examines households' general diversification of their L S and how these are related to the above socio-economic characteristics. The main objective of the examination is to determine how maize

fits into the livelihoods of Rukwa's rural households by determining its importance on the basis of land allocation. The chapter and later Chapters Six and Seven also use qualitative data obtained through the interviews and the FGDs to show its importance.

5.1 The conceptual framework

Literature shows that rural farm households practice a diversified livelihood strategy, whereby in addition to their involvement in agricultural production most engage in nonfarm income earning activities[83]. Alderman and Garcia (1993) for example report from their Pakistani study that rural households do not strictly depend on agriculture as their only source of livelihood and while crop earnings represented less than 45 percent of all earnings non-farm wages and earnings, from own enterprises contributed 41 percent of all incomes. They point out that a diversity of income sources other than crops and livestock included artisan work, village crafts, public conveyances, and various trading activities. They further point out that many households also received substantial remittances from household members working in large cities or even abroad.

Satge (2002), using the DFID livelihood framework (Figure 5.1) shows that households make their choice of a livelihood strategy amidst a number of underlying circumstances or factors. The framework shows that individuals normally operate within a vulnerability context shaped by various factors, which include shifting seasonal constraints and opportunities, economic shocks and longer-term trends. The framework also shows that individuals in managing their day to day living put together different types of livelihood assets or capital in different combinations and that these are in turn influenced by the vulnerability context, a range of institutions and processes and the individual's utilization of their asset base with the ultimate aim of achieving their desired livelihood outcomes. The outcomes could include increased income, increased well-being, reduced vulnerability, improved food security and more sustainable use of natural resources. According to Satge other livelihood analysis frameworks available for analysing livelihoods include those of CARE International, the UNDP and Oxfam. He states that despite some differences in the frameworks all employ similar concepts and the differences mainly lie in how they are organised and described.

Generally, the different livelihoods frameworks have several things in common, including people as the starting point for any development; differences among communities, among families and between members of the same family or household creating a need for different solutions and approaches for development to occur; and the fact that the poor increasingly depend on multiple sources of livelihood. The DFID framework and others also note that a households/individuals livelihood security involves building on the assets, capabilities and activities which form the basis of household livelihoods, and they also advise that households/individuals ability to have successful livelihoods needs to be examined from a

[83] Alderman and Garcia, 1993; Deacon and Krishnan, 1996; Chambers, 1997; Barret et al., 2001.

broader perspective, requiring a holistic approach which links the micro (local) and macro (larger than local) levels. According to Satge (2002) the holistic analysis enables one to determine how households/individuals and their livelihoods are influenced by their natural environment, structures, policies and systems. Warren (2002) gives a simpler conceptual framework to the pathways through which rural households diversify (Figure 5.2). However, his framework leaves out details of how the pathways could be influenced by factors such as government policy, infrastructure, the local environment and other factors shown in the DFID framework. This thesis borrows some aspects from both frameworks in examining the diversification of LS by households following the liberalization of the agricultural sector and Tanzania's economy in the 1980s.

The study generally considers diversification as the adoption by households of various household activity portfolios and income sources, and the relative diversity of sub-sectoral farm enterprises. Therefore, diversification is measured by considering both a households engagement in farm and non-farm activities and the number of LS adopted. The thesis analyses crop diversification in the agricultural sub-sector on the basis of food versus cash crops[84], examining crop production on the basis of both the percentage of a households farming land dedicated to food and cash crops and the proportion of land allocated to maize relative to other crops. The chapter further determines crop diversification by households on the basis of the number of crops cultivated. In this chapter and later in Chapters Six and Seven the thesis will particularly aim at showing how maize fits into the livelihoods of Rukwa's rural households by examining its importance on the basis of land use and income generated.

[84] The definition and conceptualization of crop diversification and how to measure it are presented in section 5.2.0

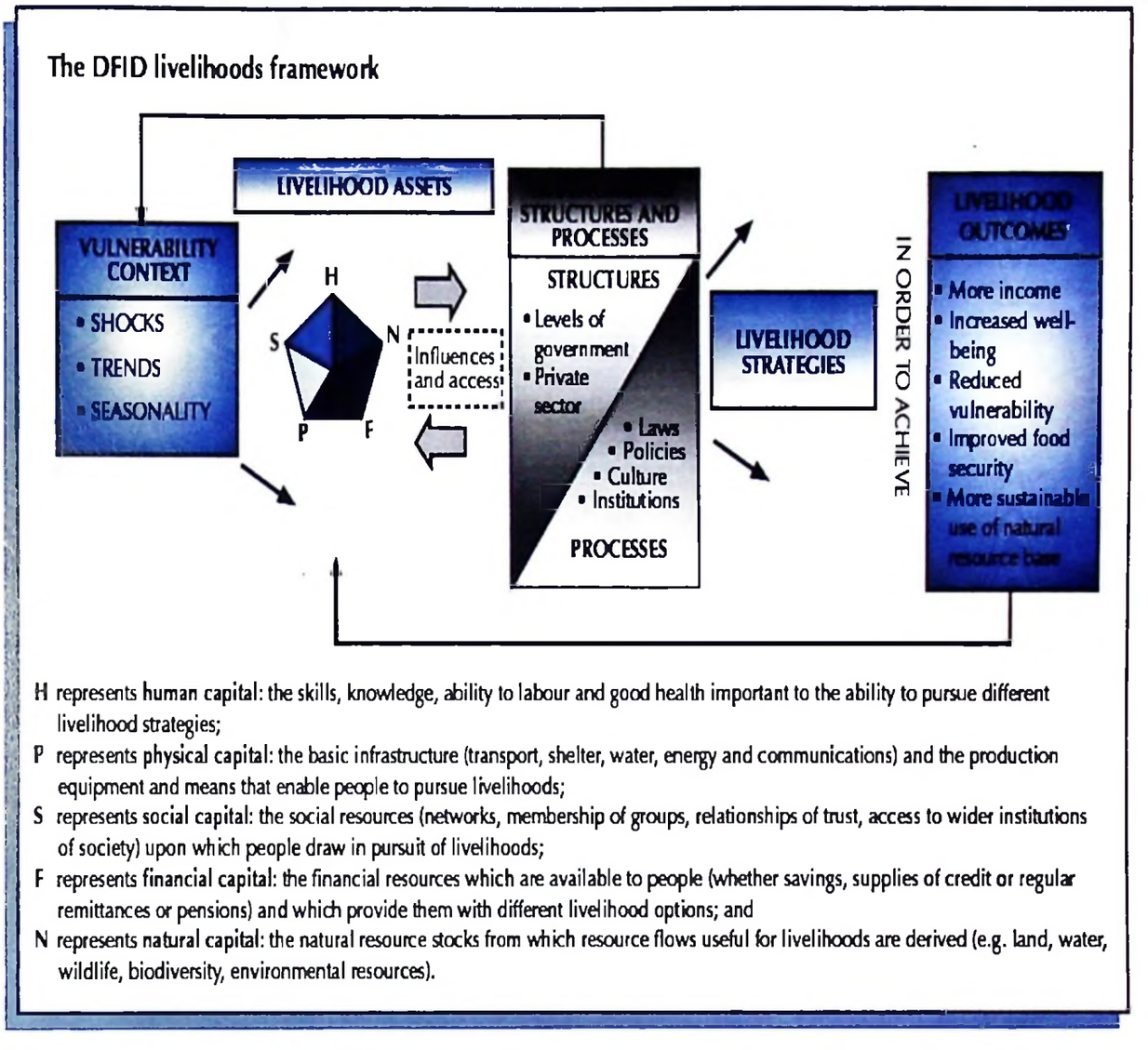


Figure 5.1: The DFID Livelihoods framework (Source: Satge, 2002)

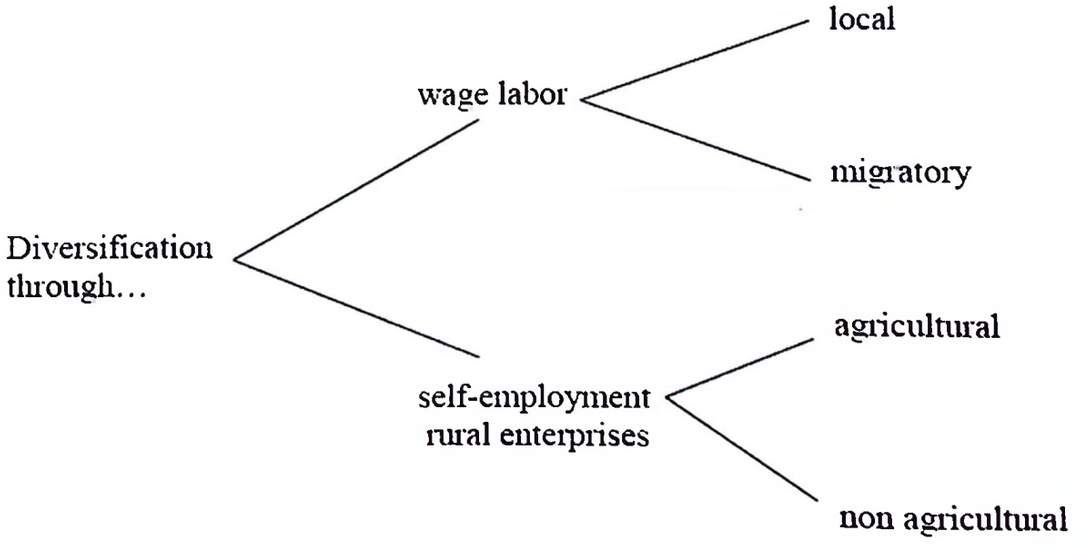


Figure 5.2: Basic alternatives in rural diversification strategies (Source: Warren, 2002)

The coming sections use summary statistics, correlation analysis, and ANOVA results from the survey data together with secondary data and qualitative information from both the individual interviews and the FGDs on addressing the above hypothesis. The correlations aim at checking for association between certain continuous variables for example age and number of crops or LS adopted. ANOVA aims at checking on the presence of variation in relation to crop and LS diversification between households and districts.

5.2 Crop diversification by households

Crop diversification is seen by many as an important means of maintaining a farmer's crop output in different situations[85]. According to Gunasena diversification can be through addition of more crops to the existing cropping system accompanied by efficient crop husbandry, for example by cultivating field crops in rice fields or growing a variety of other crops in uplands[86]. Minot (2003) argues that crop diversification is a somewhat ambiguous concept due to the fact that it is associated with both subsistence and commercial farming. He adds that in some areas poor, semi-subsistence farmers grow a wide variety of food crops in order to reduce the risk of weather-related or disease-related crop failure or to meet diverse home consumption needs. According to him this situation is normally true for farmers in remote regions, growing crops under rain-fed conditions where rainfall is not reliable as is the case for many parts of sub-Saharan Africa. However, citing Delgado and Siamwalla (1997), he points out that in other areas poor farmers are heavily dependent on staple crops for example rice in Asia, and crop diversification becomes associated with the process of commercialization as farmers start to combine food crops with higher-value commercial crops. According to Jayawardane and Weerasena (2001:112) crop diversification is "the cultivation of alternative crops or adoption of alternate cropping patterns instead of traditional crops and cropping patterns". In many parts of Tanzania smallholder farmers have the possibility of growing staples alongside cash crops such as tobacco, cotton, coffee, sunflower, and cashew nuts. As shown in Box 5.1 many would grow maize and other staples as an assurance of food security and hence different farmers allocate different proportions of their farm land to maize and other staples in accordance with their farm sizes and needs.

Crop diversification can be measured in many different ways. A simple way is to count the number of different crops grown by farmers, although this is a little crude. More interesting ways include the share of income from different crops, the share of family labour dedicated to different crops, and/or the share of land to different crops. In the context of this study, it proved difficult to collect reliable data on incomes from different crops and also on how much time was allocated to the different crops. However, as well as

[85] Gunasena 2001; Mengxiao, 2001; Luat, 2001; Minot, 2003 and Minot et al., 2006.
[86] Luat (2001:47) defines crop diversification "as the strategy of shifting from less profitable to more profitable crops, changing of variety and cropping system, increasing exports and competitiveness in both domestic and international markets, protecting the environment, and making conditions favourable for combining Agriculture- Fishery-Forestry-Livestock".

knowing the number and types of different crops grown, I also obtained data on the share of land used for different crops. So I will use these two measures to get a picture of crop diversification.

Table 5.1 shows that in general most households produced between two and three crops[87] in various combinations (Appendix 5.1 shows the complete listing of crops). However, when considering crop production at the district level some significant differences (0.05 level) existed between the districts (Appendix 5.3 shows the ANOVA results). For example overall most grow between 2 and 3 crops but Sumbawanga seems to have relatively more specialisation in a smaller number of crops whereas the other two seem to grow slightly more crops (Table 5.1).

Table 5.1: Households' crop diversification in 2005

Characteristic		Rukwa region n=200	District		
			Sumbawanga n=72	Mpanda n=67	Nkansi n=61
Crop diversification by number	0	2 (1.0)	2 (2.8)	0 (0.0)	0 (0.0)
	1	26 (13.0)	12 (16.7)	6 (9.0)	8 (13.1)
	2	67 (33.5)	34 (47.2)	19 (28.4)	14 (23.0)
	3	60 (30.0)	10 (13.9)	24 (35.8)	26 (42.6)
	More than 3	45 (22.5)	14 (19.5)	18 (26.9)	13 (21.4)
Average number of crops		2.68	2.35	2.94	2.79

Source: Survey data 2006; *NB*: Numbers in parentheses refers to percentage

The range of crops grown by households is as shown in Table 5.2; according to the table maize is important for everyone, overall and in each district. This observation generally supports the importance farm households attach to maize (Box 5.1) i.e. maize was their most important crop. The table also shows there are differences between the districts in terms of the importance of other crops, for example cassava cultivation was much more common in Mpanda. This vast diversification of crops by households across each district could be seen as their effort to ensure their food security while at the same time enabling them to earn some income as already pointed out. Although there is the possibility of an influence of the different agro-ecological zones (see Appendix 3.0) on what households could grow, it should be noted that the surveyed districts also host different ethnic groups with different food preferences. Despite the distinction shown in Table 5.2 most of the crops under the food crop category are also sold to earn households income as will later be shown. Tobacco as shown in Table 5.2 was Mpanda's major cash crop.

[87] The actual range of crops grown in 2005 was zero to eight. The number of eight is achieved if vegetables are considered in their separate forms. The zero is because two responding households did not grow any crops during 2005; however, they reported crop farming as their major occupation.

Table 5.2: Crop production by households in 2005

Characteristic		Rukwa region n=198	District		
			Sumbawanga n=70	Mpanda n=67	Nkansi n=61
Food Crop cultivated	Maize	191 (95.5)	66 (91.7)	66 (98.5)	59 (96.7)
	Rice	46 (23.0)	14 (19.4)	19 (28.4)	13 (21.3)
	Finger Millet	20 (10.0)	9 (12.5)	3 (4.5)	8 (13.1)
	Cassava	41 (20.5)	11 (15.3)	20 (29.9)	10 (16.4)
	Sorghum	1 (0.5)	1 (1.4)	0 (0.0)	0 (0.0)
	Round potatoes	5 (2.5)	1 (1.4)	3 (4.5)	1 (1.6)
	Sweet potatoes	8 (4.0)	0 (0.0)	4 (6.0)	4 (6.6)
	Beans	81 (40.5)	26 (36.1)	20 (29.9)	35 (57.4)
	Cowpeas	1 (0.5)	0 (0.0)	0 (0.0)	1 (1.6)
	Bananas	7 (3.5)	0 (0.0)	6 (9.0)	1 (1.6)
	Vegetables	10 (5.0)	4 (5.6)	3 (4.9)	3 (4.9)
Cash crops	Sunflower	43 (21.5)	20 (27.8)	4 (6.0)	19 (31.1)
	Groundnuts	41 (20.5)	7 (9.7)	20 (29.9)	14 (23.0)
	Tobacco	25 (12.5)	0 (0.0)	25 (37.3)	0 (0.0)
	Oilseeds	4 (2.0)	0 (0.0)	4 (6.0)	0 (0.0)
	Wheat	1 (0.5)	1 (1.4)	0 (0.0)	0 (0.0)
	Sugar cane	6 (3.0)	1 (1.4)	3 (4.5)	2 (3.3)

Source: Survey data 2006; *NB*: Numbers in parentheses refers to percentage of respondents reporting

The importance of maize farming to an important mix of households and those in Rukwa in general comes from the fact that the crop is seen by many as a symbol of food security. For example one respondent in Sumbawanga said "I grow maize because cassava takes too long to mature" and others expressed this in the FGDs in response to a question on what crop was their most important one, as shown in Box 5.1.

Box 5.1: The importance of maize to rural households in Rukwa

"Maize is our most important crop followed by beans and finger millet. Maize ranks number one because it is our main staple and furthermore, it also receives much promotion from agricultural extension staff. And apart from providing us with food, maize is also an important income earner to most households" **(FGD No 1 Female participants above 35 years of age, discussion held on 9/10/2006 at Sandulula village offices-Sumbawanga).**

"Maize is our most important crop followed by beans and sunflower. Maize is ranked first because it provides farm households with both food and income" **(FGD No 3 Male participants under 35 years of age, discussion held on 9/10/2006 at Sandulula village offices- Sumbawanga)**

"Maize and cassava are our most important crops; however, tobacco is the most important with regards to households' income earning as this is our major cash crop". **(FGD No 6 female participants over 35 years of age- Discussion held on 10/10/2006 at Ifukutwe village offices-Mpanda)**

"Maize is our most important crop followed by sorghum and sunflower, maize is number one because it is our main staple". **(FGD No 9 Male participants over 35 years of age, discussion held on 13/10/2006 at Kibaoni-Mpanda village offices)**

"Maize is our most important crop followed by beans and finger millet. Maize ranks number one because of the good harvests farm households get and it's also our main staple". **FGD No 13 Male participants under 35 years of age, discussion held on 18/10/2006 at Londokazi-Nkansi village offices)**

"Maize is our most important crop followed by beans and finger millet, maize holds number one importance because it is our main staple". **(FGD No 15 Male participants over 35 years of age, discussion held on 18/10/2006 at Londokazi-Nkansi village offices)**

The above quotations and the DFID livelihood framework presented in section 5.1.2 indicate that maize plays an important part not only to those households growing it for food and cash but also to those with opportunities to grow traditional cash crops like tobacco as is the case for Mpanda district. As shown in the DFID framework (Figure 5.1), food security is one of the outcomes of households' choice of livelihood strategies. Thus, maize is not only a way of ensuring a households food security; it also meets another important outcome of providing households with income.

Table 5.3 shows the combinations of crops grown by farm households as although most people grow maize, few do so in isolation. This observation supports the views of FGDs participants and respondents in response to whether reliance on maize production could enable households to get out of poverty (Box 5.3); many thought crop diversification was the only way out of poverty and to improve living standards. Furthermore, a substantial proportion said maize was only a food crop, hence the need to adopt crops like sunflower, oil seeds, beans, tobacco and permanent crops such as coffee. This observation supports the observation by Minot (2003) that crop diversification is necessary for poor, semi-subsistence farmers to reduce the risk of weather- or disease-related crop failure or to meet diverse home consumption needs.

Table 5.3: Crop diversification combinations by households in 2005

Characteristic	Rukwa region n=198	District		
		Sumbawanga n = 70	Mpanda n = 67	Nkansi n = 61
Maize only	22 (11.1)	10 (14.3)	7 (10.5)	5 (8.2)
Maize and beans	21 (10.6)	12 (17.1)	2 (3.0)	7 (11.5)
Maize and rice	13 (6.6)	7 (10.0)	4 (6.0)	2 (3.3)
Maize and cassava	9 (4.5)	6 (8.6)	3 (4.5)	0 (0.0)
Maize and sunflower	8 (4.0)	4 (5.7)	1 (1.5)	3 (4.9)
Maize and tobacco	7 (3.5)	0 (0.0)	7 (10.5)	0 (0.0)
Maize beans and sunflower	17 (8.6)	5 (7.1)	0 (0.0)	12 (19.7)
Maize, millet and beans	4 (2.0)	1 (1.4)	0 (0.0)	3 (4.9)
Maize, rice and cassava	5 (2.5)	0 (0.0)	4 (6.0)	1 (1.6)
Maize, tobacco and beans	4 (2.0)	0 (0.0)	4 (6.0)	0 (0.0)
Maize, tobacco and groundnuts	4 (2.0)	0 (0.0)	4 (6.0)	0 (0.0)
Maize, beans, groundnuts and tobacco	5 (2.5)	0 (0.0)	5 (7.5)	0 (0.0)
Other crop combinations reported by less than 4 respondents (regional level)	79 (39.9)	24 (34.3)	27 (40.3)	28 (45.9)

Source: Survey data 2006; *NB*: Numbers in parentheses indicates percentage

Examining the number of crops grown by households and their combinations (section 5.2) has yielded some Interesting insights in to crop diversification. The thesis now aims to examine how land affects on and off-farm diversification of LS. Table 5.7 shows the number of crops, land allocation to maize and other food crops overall based on a number of key characteristics. The next section begins by examining diversification by farm size and farm fragmentation, thereafter section 5.4 will examine other characteristics.

5.3 Farm size, fragmentation and crop diversification

The importance of a household's farm size to rural livelihoods is widely reported in literature[88]. It is argued that the size of a farm is not only important for a household's choice of LS but also its endeavour to get out of poverty. Currently, in trying to revisit the role of agriculture in poverty reduction the debate is whether emphasis should be on promotion of small farms or large farms (Hazel et al., 2007). Hazel et al. argue that small farms could be more efficient with regards to use of land and labour due to low labour supervision costs as compared to large farms. However, they also point out that larger farms do have an advantage when it comes to transactions with the broader world in procuring inputs, marketing of produce and access to credit compared to the small farms. According to Immink and Alarcón, (1992) both large and small farms have the capability to diversify. As pointed out in section 5.0 whereas large farms are capable of diversifying by adopting new crops, the small ones can also diversify by using their small pieces of land to practice crop diversification, spreading risk across different activities.

[88] Immink and Alarcón, 1992; Block and Webb 2001; Ellis 2005; Hazel et al., 2007 and Wiggins, 2009.

Table 5.4 shows the average farm sizes, land holding type and number of plots owned by households. In general just over fifty percent owned land holdings of less than 2 ha, and overall the average farm size was 2.29 ha (Table 3.1) which is close the regional average of 2 ha estimated by the government in the 2003 Tanzanian National Agricultural Census (NBS et al., 2006). Table 5.4 also shows that households with more than 2 ha also cultivated more crops on average. As shown in Table 5.9, such households were also more able to allocate more land to cash crops. A household's farm size was positively correlated (0.001 level) to the number of crops grown in 2005 (Appendix 5.2 shows the correlation results). Appendix 5.2 also shows that the proportion of farmland allocated to both maize and general food crop production was significantly (0.001 level) negatively correlated to a household's farm size. This suggests that households with more land were able to allocate more land to cash crops as compared to those with less and were also able to grow a greater variety of crops. This suggests that diversification is related to land resources a farmer has available to him or her, although the causality is not tested here: it is possible that farmers who have practiced more diversification have been able to acquire more land as a result of the larger volume of output.

Table 5.4: Households' farm characteristics and crop diversification in 2005

Characteristic		Frequency	Average number of crops grown	Average farm size (ha)
Type of farm land owned	As a single plot	95 (47.5)	2.37	2.31
	Several plots	105 (52.5)	2.95	2.27
Number of plots owned	1	9 5(47.5)	2.68	2.31
	2	50 (25.0)	2.47	2.14
	3 and more	55 (27.5)	2.84	2.37
Number of crops grown on basis of farm size categories	≤ 2ha*	102 (51.0)	2.10	1.09
	>2ha	98 (49.0)	3.29	3.54
Household's tillage method	Uses of oxen	87 (43.5)	2.86	2.74
	Uses hand hoe	113 (56.5)	2.54	1.94

NB: Numbers in brackets indicate percentages

Table 5.4 above also shows that less than half of households had their farmland as a single plot and over a quarter owned 3 or more plots. However, the number of farming plots owned by households was not significantly correlated to the number of crops grown (Appendix 5.2).

Table 5.5 suggests presence of variations in diversification across farm type; households with fragmented farmland allocated on average a higher proportion of their land to food crop production compared to those whose farm land was a single plot. ANOVA results (Appendix 5.3) also show the presence of significant variations in relation to households' allocation of farm land to maize, food and cash crops. As shown in Table 5.5 those with single plots allocated a higher proportion of their land to both maize (as a percentage of land allocated to food crops) and cash crops whereas those with fragmented land did allocate more

land to food crops. This observation seems to concur with the argument by Blarel et al., 1992, that land fragmentation is at times associated with matching soil types to crop needs, enabling households with many plots to match them to different crop requirements, for example planting rice on wet lands (plains).

Table 5.5: Crop diversification on basis of percentage of land allocated to maize, other food and cash crops as per households' farm characteristic

Diversification basis		Average land allocation in 2005 (%)			
		Maize	Maize land relative to food crops	Food crops	Cash crops
Household's farm type	Single/consolidated (n = 95)	54.62	68.77	82.18	17.82
	Fragmented (n = 105)	58.39	67.21	87.39	12.69
Household's farm size	≤ 2ha* (n = 102)	59.99	67.17	88.84	11.16
	>2ha (n = 98)	53.07	68.77	78.79	21.21

Nb: *This is based on the regions average utilizable land as per the 2002/03 agricultural census (NBS et al., 2006)

The use of hand hoes continues to be prevalent in many parts of Africa and Tanzania is no exception. According to FAO (2006) use of draught animals for example oxen, could enable saving of labour, reduce drudgery, and save time of up to between 5 - 20 times compared to using only manual labour. Use of draught power could also increase a households LS diversification potential and also allow expansion of cultivated areas. An expansion of cultivated area could both increase the volumes if one crop is produced or allow many crops to be produced resulting in an increase in a households crop diversification.

Table 5.6 shows that most households use the hand hoe as their major farm implement[89]. Tractor ploughing in Rukwa is almost negligible and none of households surveyed reported its use. According to Table 5.6 households using oxen in their land preparation grew more crops on average compared to those reliant on the hand hoe; this may have been made possible by the fact that these households owned more land, which they also easily ploughed using oxen. ANOVA results (Appendix 5.3) show the presence of significant variations between households using the hand hoe and those using oxen in their land preparation with regard to the amount of farmland cultivated in 2005, the percentage of a household's farm land allocated to food and cash crops in 2005, and the number of crops grown. This observation suggests that due to the drudgery involved in land preparation households relying on the hand hoe may find themselves having to struggle with land preparation at times well into the first rains, particularly where hard textured soils are involved, compared to those using oxen. The latter could wait for the first rains to soften the ground and thereafter plough while at the same time sowing the seeds, which is quite common in many places of Tanzania. Furthermore, the amount of land that can be tilled using the hand hoe per day is very small when compared to that by oxen/draught animals. Therefore, the above results suggest that

[89] According to NBS et al. (2006) 56 %, 32 % and 4 % of the total farmed land/planted area in Tanzania is ploughed by hand hoe, oxen and tractors respectively.

households with larger farms and use of oxen in land preparation were not only able to cultivate more land but also to diversify more, as they could meet their food needs more easily and have time left over to grow other crops.

Table 5.6: Crop diversification on the basis of a household's method of land preparation

		Household's farm size		Average farm size	Average number of crops
		≤ 2 ha*(n=102)	> 2ha (n = 98)		
Household's tillage method	Hand hoe	67 (65.7)	46 (46.9)	1.94	2.54
	Oxen	35 (34.3)	52 (53.1)	2.74	2.86
Average number of crops		**2.1**	**3.29**	**na**	**na**

NB: Numbers in brackets indicate percentages

Geographical location of farm households can influence both quantity and quality of land available for households' crop production, as shown in Box 5.2. Literature shows that location may be important in terms of access to both agricultural input and output markets, thus influencing rural households' crop diversification[90]. Reduced market access has been shown to significantly reduce crop diversity (Van Dusen and Taylor; 2005). Table 5.7 shows households' crop diversification on the basis of land allocation to crops and some household characteristics, demonstrating that households in Nkansi have on average allocated more land to food crops relative to Sumbawanga and Mpanda. According to ANOVA results (Appendix 5.3), a significant variation did exist between the districts in relation to the percentage of farm land allocated to food and cash crops in 2005: allocation of land to food crops was higher in both Sumbawanga and Nkansi compared to Mpanda, and households in the latter allocated on average more land to cash crops. Mpanda's allocation of more land to cash crops could be based on the fact that about half the households grew tobacco, a traditional cash crop now there. Mpanda borders Tabora, a famous tobacco growing region in Tanzania. Mpanda enjoys a rail link to Dar es Salaam port, which is crucial for companies engaged in the purchase and export of tobacco and other cash crops. The other three districts lack such a traditional cash crop. Coffee, which was introduced to the region recently, is also only grown in Mwese highlands in Mpanda district (URTet al., 2004).

[90]Van Dusen and Taylor; 2005 and Minot et al., 2006;

Box 5.2: Distribution of arable land in Rukwa

The Table below shows that about 34 % of the total land area in Rukwa region is suitable for agriculture and that despite Mpanda district having the largest land area only a fifth is arable. The table also shows that all the districts have potential for expanding area under crop production as in 2002 none of the districts with the exception of Sumbawanga urban was using a quarter of their arable land.

Distribution of arable land and land under cultivation by district, Rukwa region, 2002

District	Total land area (ha)	Arable area (ha)	Arable as % of total land area	Average area under cultivation	
				Ha	% arable land
Mpanda	4,584,300	923,136	20	211,460	23
Nkansi	937,500	506,250	54	60,180	12
Sumbawanga (R)	1,208,800	838,600	69	189,081	23
Sumbawanga (U)	132,900	89,043	67	29,461	33
Total	6,863,500	2,357,029	34	490,182	21

Source: URT/RRCO/NBS, 2004

From the above it can be concluded that farm sizes were the major determinant of the household's crop diversification in 2005; larger farms had more crops grown and households were also able to allocate a higher proportion of land to cash crops. The relatively higher number of crops grown by owners of larger farms was made possible by the relatively higher use of oxen in land preparation compared to those with smaller farms who were more reliant on the hand hoe. The results have shown that the number of farm plots owned did not affect a household's crop diversification in 2005.

5.4 Other household socio-economic characteristics and crop diversification

This section examines the relationship between other household socio-economic characteristics and crop diversification. As will be shown in the specific sub-sections, crop diversification by households can be influenced by many factors, including age of a household's head, sex, education level, household size, access to markets and location. Table 5.7 shows the characteristics to be considered and how they are related to the amount of land allocated to maize, general food, and cash crop production; discussions of these are presented in subsequent sub-sections.

Table 5.7: Crop diversification on basis of percentage of land allocated to maize, other food and cash crops relative to households socio-economic characteristics

Characteristic		Average number of crops grown	Average land allocation in 2005			
			Maize as a % farm land	Maize land as a % food crops land	Food crops as a % farm land	Cash crops as a % farm land
Geographic area	Rukwa region (n = 200)	2.68	56.60	67.95	84.91	15.09
	Sumbawanga district (n =72)	2.35	59.47	65.82	90.11	9.89
	Mpanda district (n = 67)	2.94	51.09	71.88	74.29	25.71
	Nkansi district (n = 61)	2.79	59.27	66.16	90.45	9.55
Age categories of household heads	Young household heads (up to 35 years) (n = 57)	2.81	51.41	62.44	83.96	16.04
	Medium aged household heads (35 to 59 years)(n = 111)	2.74	58.43	69.71	85.11	14.89
	Older household heads (over 59 years) (n = 32)	2.25	59.51	71.67	85.92	14.08
Gender of households head	Male (n = 169)	2.74	55.73	67.83	84.36	15.64
	Female (n = 31)	2.35	61.32	68.62	87.90	12.10
Households head education level	< 7 years of schooling (n= 127)	2.49	64.14	71.26	90.58	9.42
	> 7 years of schooling (n = 73)	2.79	52.27	66.05	81.66	18.34

Source: Survey data 2006

Age of a household's head is reported to be a factor that may influence households' crop diversification. According to Minot et al. (2006) despite difficulties in determining the influence of a household head's age on crop diversification it is generally assumed that the vast experience accumulated over time by older heads makes it a possibility that they could specialize in fewer crops. However, Minot *et al.* point out that more experience and accumulation of assets may allow these households to diversify into more remunerative non-farm activities while maintaining food production for own consumption, potentially leading to greater income and crop diversification.

Generally, Table 5.7 above shows that households headed by young heads grew on average more crops as compared to those headed by older heads. It also shows that they allocated less land to maize production, both as a proportion of their farm and as a proportion of land allocated to general food production. The Table also shows that in 2005 older heads allocated less land to cash crops compared to younger and middle-aged heads. Appendix 5.2 shows a negative correlation between age and number of crops grown; despite its statistical insignificance, the observation seems to suggest a reduction in number of crops grown by households with an increase of the household head's age. The observation partly confirms what Minot et al. have pointed out, that despite the number of crops grown by households increasing with age up to 68 it does also slow down at some earlier point. The results show that less than

10% of households were headed by heads above 68 years; they were smaller in size than those headed by younger household heads and those between 36 and 59.

Additionally, older heads (above 59) owned less land compared with medium-aged (36 -59) and younger (up to 35) heads; in 2005 average farm sizes for the groups was 1.74 ha, 2.31 and 2.58 respectively. Less land being held by older heads could imply reduced ability to grow many crops hence the negative correlation observed between age and number of crops grown. The small size of some households headed by heads above 68 may also imply a possible shortage of own labour to manage more crops. Hemmings-Gapihan (1983), cited by Messer (1990), argues that some economic interventions can lead to an alteration of the social structure in communities, for example adults advanced in age could find themselves in short supply of labour inputs of younger people as a result of a break-up of the extended family into nuclear units. Therefore, in order for such households to be able to grow many crops especially if not practicing mixed cropping on the same plot, they would either need cash for hiring causal labour or assistance from relatives and/or friends. However, given the nature of the rural economy, relatives and/or friends might not assist if they are also busy with their own crop production. Study observations (Chapter Six) also suggest that hiring of casual labour by households headed by older heads was not popular.

Appendix 5.1a also shows that the proportion of a household's farm land allocated to maize and other food crops production was positively correlated to the household's head's age. However, it shows that the age of a household's head was negatively correlated to the proportion of land allocated to cash crop production. However, the correlations were statistically insignificant. This observation suggests that as the age of a household head increases there is a general tendency to shift towards self food sufficiency[91].

The negative correlation observed between age and number of crops grown suggests that older heads grew fewer crops in 2005, had less land but put more of it to maize and other food crops production. It is also concluded that whereas the proportion of a household's farmland allocated to food crops was positive that allocated to cash crops was negatively correlated to the household's head's age. This observation seems to suggest that older heads may be more specialized in terms of number of crops and amount of land used for food crops than the younger heads. This could be because either they are using their wisdom or experience to specialize in a few key crops that they know work best on their soil, or they are more diversified in off-farm activities so only uses farms for food needs. The relationship between age and diversification of household LS is further examined in section 5.7.

---

[91] A study in Nigeria by Echebiri and Mbanasor (2003) showed that there was a tendency of an upward trend in mean age both of hired and farmers involved in food crop production. The study's observation and what was observed by the above duo may imply that older heads are more concerned with self food sufficiency relative to younger heads who may venture into production of crops of higher value, whereby income earned is then used to buy household consumption items, rather than be limited to producing for own consumption (Timmer 1997; Pingali 1997, cited by Govereh and Jayne (1999:2).

Gender's role in diversification of LS and hence crop production is acknowledged in literature[92]. For example Horrel (2008) argues that FHHs lack of assets, and in particular those required for agricultural production, can adversely constrain such households' ability to diversify both in terms of types of crops grown and in taking advantage of local labour market options. Generally, results (Table 5.7 and 5.8) show that FHHs owned less farm land, grew on average fewer crops and allocated more land to food crop production relative to MHHs. However, ANOVA results (Appendix 5.3) show that the variation between numbers of crops grown by both was only slightly significant. They also show that the difference in percentage of land allocated to food and cash crops between the two genders was statistically insignificant. A major factor in FHHs growing fewer crops in 2005, as pointed out above, is size of their farms; section 5.3 showed that a significant (0.001) positive relationship existed between farm size and number of crops grown. This observation is further supported by ANOVA results (Appendix 5.3) which show that land ownership varied significantly (0.05) between FHHs and MHHs. Therefore, the cultivation of fewer crops by FHHs may have been dictated by their smaller farm sizes and the need to first ensure their household's food security before thinking of increasing their income from cash crops[93]. Furthermore, there were no significant variations with regard to the number of plots owned, household size and number of dependent children within households between the two (Appendix 5.5). Despite the lack of significant variation between FHHs and MHHs with regards to crop diversification based on land allocated to food and cash crops, a slight variation was observed in relation to the number of crops grown; MHHs grew slightly more.

[92] Ellis, 2000; Gladwin et al., 2001, Warren, 2002; Dolan, 2002 and WB, 2007.
[93] According to FAO Focus (http://www.fao.org/FOCUS/E/Women/Sustin-e.htm-17/9/2005) women are responsible for between 60 to 80 percent of the food produced in most developing countries.

Table 5.8: Households' crop diversification in 2005

Characteristic		Household's head's sex	
		Male (n = 169)	Female (n = 31)
Average farm size		2.44	1.44
Farmland cultivated	As a single plot	81 (47.9)	14 (45.2)
	Several plots	88 (52.1)	17 (54.8)
Number of plots owned	1	81 (47.9)	14 (45.2)
	2	41 (24.3)	6 (19.4)
	3 and more	47 (27.8)	11 (35.7)
	Average	2.03	2.06
Crop diversification by number	0	2 (1.2)	0 (0.0)
	1	20 (11.8)	6 (19.4)
	2	54 (32.0)	13 (41.9)
	3	53(31.4)	7 (22.6)
	More than 3	40(23.7)	5 (16.1)
	Average	2.74	2.35
Average household size		5.93	5.61
Average number of children under fifteen years or still in school		3.55	3.23

Source: Survey data 2006; *NB*: Numbers in brackets refer to percentage.

Education of household heads is an important factor in a household's choice of LS[94]. According to Minot et al. (2006) higher education levels of household heads is expected to be associated with the production of higher value crops, more commercially oriented agriculture, and greater participation in non-farm activities. However, they also point out that there is a lack of clarity as to whether education would translate into a wider range of crops or fewer crops. These two assumptions are on the one hand based on the fact that a more educated head of household could be more easily tempted into experimenting with new crops, and on the other, that the accumulated skills might be devoted to crop specialization. Omiti et al. (2009) have reported that education is an important factor in households' commercialization of their crop production.

Results from a correlation analysis (Appendix 5.1a) show that a household head's level of education is positively and significantly (0.001 levels) related to the proportion of farmland allocated to cash crops, but its relationship with maize and general food crops was negative and significant[95]. The observations suggest that as the education level of a household head increased the tendency was to reduce the proportion of farm land allocated to maize and general food crop production in favour of cash crops. In addition Table 5.7 shows that household heads with seven years or more of schooling allocated less land

[94] Unni, 1996; Winters et al., 2001; Marzano, 2002; Galab et al., 2006 and Minot et al. (2006.

[95] The study has chosen 7 years as the cut-off, based on the fact that in Tanzania primary school education lasts for 7 years and education was universally provided to all school age children since the 1970s at the states cost (see section 5.1.0). Kiabaara (2005) has also argued that farmers in the developing world need to have at least five years of schooling to facilitate poverty reduction of their households due to education's influence on a household's choice and adoption of technologies and general productivity. The author thought 7 years of schooling would be a useful threshold. According to the NBS (2007) the proportion of Tanzania's rural adult population with 5 -8 years of schooling has increased from about fifty percent in 1991/92 to fifty-four percent in 2007.

to maize and other food crops. This observation supports others by Minot et al. (2006) and Omiti et al. (2009), that more educated households seem to diversify their crop production into higher value crops compared to the less educated. Available data (Appendix 5.6) suggests that households with more educated heads possessed on average more land than the less educated. They also reported a higher average annual income in 2005 compared to the less educated. A higher income would also give them a higher possibility of hiring labour for crop production in case of need. According to Appendix 5.6 households with more educated heads used relatively more hired labour in their crop production, so it may not be wrong to assume that more education enabled them to produce on average more crops than households with less educated heads.

Household size, according to Minot et al. could be an important factor in enabling cultivation of a larger number of crops by households due to new fixed costs arising from the introduction of each new crop. However, they do point out that holding the farm size constant the marginal product of additional family labour in crop production normally declines as the household size increases and that this acts a push factor to seek alternative sources of income.

The average household size for households was 5.88; figures for the districts were; 5.29, 6.22 and 6.21 for Sumbawanga, Mpanda and Nkansi respectively (Table 3.4)[96]. According to Appendix 5.2 there was a significant (0.05 level) negative relationship between household size and its allocation of farmland to food crops production. The Appendix also shows the presence of a significant (0.05 level) positive relationship between a household's size and the number of crops grown. These observations suggest that larger households tended to grow on average more crops than smaller ones; and that with an increase in size, households increased the proportion of farm land allocated to cash crops. These observations echo the observation by Minot et al. mentioned above that adoption of new crops by households would usually require additional labour. While better-off households could rely on their cash to hire labour, poorly resourced farmers normally rely on their own supply of labour, as shown in section 5.4 below. Allocation of more land to cash crops or higher value crops also implies that even if households are unable to produce all the food they require they can still buy it from the market using income from higher value crops.

Generally, the section concludes that older heads seem to be more specialized in terms of the number of crops and amount of land used for food crops than the younger heads; they grew fewer crops. This could either be because they are using their wisdom or experience to specialize in a few key crops that they know work best on their soil, or because they are more diversified in off-farm activities and so only use their farms for food needs. The observation that older heads grew fewer crops seems to be in line with literature as pointed earlier that despite the number of crops grown by households increasing with age a

[96]The observed household sizes are relatively higher than the 5.1 and 4.9 averages reported for Rukwa and Tanzania respectively by NBS (2002). The difference may be a result of the study's small sample size and hence some bias relative to a national census.

point reaches when this slows down with further increase in age[97]. As regards gender it is concluded that despite the lack of significant variation between FHHs and MHHs with regard to crop diversification on the basis of land allocated to food and cash crops, a slight variation was observed in relation to number of crops grown; MHHs grew slightly more.

The chapter also concludes that the number of formal school years possessed by a household's head had a significant influence on the number of crops grown by households in 2005; those with more education seem to be growing more crops relative to those with less. The results also show that the more educated dedicated more land to cash crops compared to the less educated. This outcomes support what other literature has reported, that the higher the level of an individual's education the more capable they become with regard to choice of what crops to grow, how to produce and even what LS to engage in. Lastly, the results suggest that larger households tended to grow on average more crops than smaller ones, supporting the observation by Minot et al. (2006) that adoption of new crops by households would at most times require additional labour.

5.5 Household livelihood diversification

The previous sections have focused on crop diversification, but this one deals with households' overall struggles, as will be shown below. Most households adopt a variety of LS and few rely on the sale of crops only. Farming's inability to provide for households' needs has been pointed out by many[98]. As described in Chapter two, most if not all rural households have a general tendency to diversify their LS or income earning activities[99]. Section 5.1 has also shown that diversification of LS enables households to not only ensure that they achieve livelihood security under improving economic conditions, but also to mitigate livelihood distress in deteriorating conditions (Collier, 1988 as cited by Preston,1989). According to Ellis (1999), empirical evidence shows that rural households rely on diversified income portfolios and that in sub-Saharan Africa non-farm income sources account for between 30 and 50 per cent, rising to 80 to 90 per cent in southern Africa. Diversification of LS has also been reported to be crucial in enabling households to insulate themselves from environmental and economic shock trends and seasonality, making them less vulnerable (Ellis and Allison, 2004). These observations are supported by the arguments put forward both in the individual interviews and the FGDs as shown in Box 5.3.

[97] Dos et al., 2003 and Minot et al., 2006.
[98] Ellis 1998, Carswell 2000; Deb et al., 2002; OPM 2004 and 2002; Kejala et al., 2006; and Reardon et al., 2007.
[99] This depends on how a particular group decides to conceptualize diversification of livelihood strategies.

Box 5.3: Livelihood diversification as a way out of poverty

In response to a question on the ability of maize production to enable households to get out of poverty, some of the respondents and FGDs participants pointed out the following:

"To get out of poverty in our area, households need to properly engage in crop production and thereafter use the income earned through sale of crops to start up a business/petty trade". **FGD No 2 Female participants under 35 years of age- 9/10/2006 at Sandulula village office- Sumbawanga**

"The only way out of poverty/to improve a households' living standard in our area is through cultivation of oilseeds and then using income earned to start some other enterprise or business". **FGD No 11 female participants - 13/10/2006 at Kibaoni village office - Mpanda.**

Although other FGDs did not mention diversification into other LS, some mentioned diversifying their crop production, suggesting that households would need in addition to growing maize to grow crops such as tobacco, beans, ground nuts, rice, sesame, sunflower and finger millet. One FGD suggested that there was a need for households to establish permanent crops (e.g. coffee) upon which they could rely in old age.

Similar views to the above were expressed in the individual interviews as shown below;
"I do not think a household can only rely on crop production to get out of poverty" **A 31 year old male farmer from Ninga village, Sumbawanga district-5/10/2006**

" A household cannot rely on crop production to get out of poverty, because using the hand hoe can only enable you to cultivate a small area so the income earned is little" **A 38 year old male farmer in Kapalamsenga village, Mpanda district-12/10/2006**

" No one cannot rely on crop production to get out of poverty, because if harvests fail in a particular year then you have to wait till the next year's cropping season" **A 42 year old in Kapalamsenga village, Mpanda district-12/10/2006**

"In our area one cannot rely on crop production alone to get out of poverty due to our use of poor technologies such as the hand hoe and lack of access to extension services. Furthermore, our crop production is reliant on availability of rains so it is very unpredictable" **A 53 year old Male farmer from Kapalamsenga village, Mpanda district-12/10/2006.**

Most of the other farmers believed crop diversification could enable them get out of poverty or further improve their living conditions. However, some stressed the need of assistance particularly in the provision of free or affordable inputs. Some also pointed out that for crop production to get them out of poverty they needed to forego the outdated technologies currently in use by most households.

Households' diversification of their LS can be determined in various ways. Some existing literature uses the on-farm and off-farm categorization[100]. According to Minot et al., (2006) a households diversification of LS could be determined in four major ways; considering its engagement in farm and non-farm activities; its diversification into high-value activities; commercialization of its production; and lastly, its engagement in multiple sources of income. Minot et al., also point out that whereas the first three methods are somewhat complicated as they take into account both the number of sources and the balance among them, the last simply considers the number of income generating activities a household is involved in[101]. These combinations will be used to explore the on-farm and off-farm balance of household LS. Unfortunately,

[100] Ellis, 2000; Barret et al., 2001; Barrett et al., 2005 as cited by Schwarze and Zeller, 2005 and Minot et al., 2006.
[101] In determining diversification through farm activities and activities such as non-farm enterprises and wage income, one needs to determine the share of income from non-agricultural activities. Use of diversification into high-value activities requires data on the share of area or income from high value crops and the percentage of income from non-crop agricultural activities (including livestock, fisheries, and forestry). Diversification on basis of commercialization requires one to determine the extent of commercialization of each crop or activity (Minot et al., 2006)

data limitations do not allow the current study to fully use the first three methods as it is not possible to accurately determine the actual percentage contribution of each adopted LS to the surveyed household's well-being or the amount of time spent on the execution of each of the LS. Therefore, the study examines the diversification of a household's LS on the basis of the number of economic activities adopted be it in the form of direct income or payment in-kind (including food, access to draught power, inputs acquisition) [102]. Nevertheless the study, as shown in Table 5.10, does group households on the basis of a broader categorization of their LS.

Livelihood strategies adopted by households are shown in Table 5.9. The most popular included crop production, livestock keeping, petty trade, casual labour and remittances. Similar findings have been made by other researchers (see section 5.2); however as observations from the study show (Table 5.10), the choice of strategies may differ in terms of proportion and intensity from one community to another and/or within communities.

Table: 5.9: Livelihood strategies adopted by households in 2005

Characteristic	Rukwa Region (n = 200)	District		
		Sumbawanga (n = 72)	Mpanda (n = 67)	Nkansi (n = 61)
Crop production	200 (100)	72 (100)	67 (100)	61 (100)
Livestock keeping	104 (53.0)	37 (51.4)	34 (50.7)	33 (54.1)
Petty trade	91 (45.5)	31 (43.1)	29 (43.3)	31 (50.8)
Casual labour	60 (30.0)	17 (23.6)	25 (37.3)	18 (29.5)
Remittances	35 (17.5)	19 (26.4)	10 (14.9)	6 (9.8)
Local brew	12 (6.0)	4 (5.6)	1 (1.5)	7 (11.5)
Fishing	11 (5.5)	11 (15.3)	0 (0.0)	0 (0.0)
Paid employment	10 (5.0)	5 (6.9)	3 (4.5)	2 (3.3)
Carpentry/masonry/welding	5 (2.5)	2 (2.8)	1 (1.5)	2 (3.3)
Renting out house	1 (0.5)	1 (1.4)	0 (0.0)	0 (0.0)
Grain milling machine	1 (0.5)	1 (1.4)	0 (0.0)	0 (0.0)
Practicing traditional medicines	1 (0.5)	0 (0.0)	1 (1.5)	0 (0.0)

Source: Survey data 2006; *NB*: Numbers in parentheses refers to percentage.

Crops grown by households are presented in section 5.2 in livestock keeping households normally reared a variety of animals which included cattle, pigs, sheep, goats and poultry (chicken and ducks). The importance of livestock keeping as a livelihood strategy seems to be similar in all the districts. The current study found the keeping of cattle was more pronounced in Nkansi, however, this observation may only be coincidental[103]. Most of the animals kept by households were managed on a free range basis: the animals,

[102] This type of classification has been used because data collected did not clearly show hours spent on each activity or the actual income contribution percentage of a particular activity to the household's income and wealth. Other studies using this type of classification are by Ersado (1997) and Carswell (2000).

[103] Results from the study do not match reports by URT et al. (2004) that Sumbawanga leads in cattle numbers followed by Mpanda. According to the URT estimates, Nkansi district leads in goat population, followed by

including chicken and pigs, fended for themselves in the communal land and around houses within the surveyed villages.

Petty trade by households mainly involved the operation of unlicensed small kiosks or shops selling a variety of day-to-day household necessities in different proportions of the items traded. Generally, households in this type of trade arrange items for sale on tables under a shade, in a room in their house, or in a detached structure constructed of mud and wooden poles with a roof made of thatch or corrugated iron sheets.

Casual labour as a LS played a more important role in Mpanda compared to the other two districts. This may be due to many farmers in Mpanda being involved in tobacco farming, a cash crop that demands plenty of labour for its cultivation. Some farmers with larger farms or with a greater percentage of their land devoted to tobacco may be unable to provide the labour for both tobacco and cereals production, hence a need to hire labour for either or both. Fishing as LS was only mentioned in Sumbawanga despite the other two districts having access to Lake Tanganyika[104]. Sumbawanga has access to both Lake Tanganyika and Lake Rukwa; the latter is not accessible by households in the other two districts. Generally, fishing was done with boats, some of which are owned by the fishermen themselves and others hired. Fishing in Lake Tanganyika and Rukwa is an all year round activity, with assured markets within the area concerned and far beyond to other districts and/or even neighbouring regions.

The contribution of remittances to households' livelihoods appears more important in Sumbawanga compared to the other two, perhaps indicating that households in Sumbawanga have a higher number of household members or relatives working elsewhere. Remittances mostly came from children who have migrated to urban areas, where they may have secured employment in either the formal or informal sector. In other cases remittances might come from children or other relatives who had migrated or, in the case of females, married and moved to other villages or even districts; being particularly common when they are more successful than their parents, or in case of unforeseen difficulties like sickness at home. The local brew business mostly involved women who either use some of their own maize or buy some from the market and use it to prepare alcohol for sale in the homes either once or twice per month, depending on demand in the village. Although brewing can be done all year round it is more popular during and after the harvest period, when households have plenty of maize and leisure time.

Sumbawanga. The difference may be due to the small sample used in the study but also the need to mainly cover households involved in maize production whereas the URT data covers all households. The estimates also show that Sumbawanga has the highest pig population and Mpanda the highest sheep population. Nkansi trails behind in both.

[104] The current study did not manage to cover villages in Mpanda and Nkansi with households engaged in fishing, thus the observed discrepancy.

The LS observed in by the study can broadly be grouped into four categories: households producing crops and keeping livestock[105]; households producing crops and engaged in non-farm income generating activities; households producing crops, keeping livestock and engaged in non-farm income generating activities; and households involved only in crop production as their major source of livelihood. In the non-farm group the thesis includes activities such as petty trade, casual labour, remittances, preparation and sale of local brew, fishing, paid employment, carpentry, masonry and welding. Other strategies included renting out of rooms or houses, running grain milling machines and traditional healing. Crop production as the only LS was reported by less than a tenth of households (Table 5.10). Therefore, although all households were growing crops, most adopted other LS to supplement or complement it as a LS. Generally, the Table shows that 49 per cent and 36.3 per cent of households adopted crop production and non-farm activities and crop production, livestock production and non-farm activities respectively.

5.6 Farm characteristics and households' diversification of livelihood strategies

Section 5.0 showed that farm size has the capacity to influence a households diversification of its LS, insofar as those with less land but much labour could use some of their labour on the household's farm and also work for wages as off-farm labourers especially in the absence of well-functioning land markets, and those with plenty of labour could diversify by moving out of agriculture. Generally, results show that a household's farm size did not affect its ability to diversify LS (Table 5.10). This contradicts the observations in section 5.0. However, a simple explanation based on the limited data available at present is the fact that some of the LS adopted by households in the study area for example livestock keeping, petty trade and fishing, did not rely on the farm size of households, as these activities were normally carried out on communally owned land and water bodies[106]. Furthermore, other non-farm activities required very little or no land at all in their execution; for example petty trade required either a small part of the household's premises or communal places such as the market or the roadside. Most villages and sub-urban areas have communal land where interested households can graze their cattle or put up shades for petty trade.

Table 5.10 shows how households diversified their LS on basis of their farm sizes and tillage method. According to the Table a relatively higher proportion of households with up to 2 ha of farmland adopted non-farm activities in addition to their crop production, and a relatively higher proportion of those with more land adopted livestock and non-farm activities in addition to crop production. Though Table 5.10 shows

[105] Livestock keeping has been considered separate from farm (crop production) because of its own potential to enable households to solely survive on it as LS, which is the case with the pastoral communities of Tanzania (e.g. the Maasai). FAO also point out that livestock can provide a steady stream of food and revenues and that it's the only livelihood option that the landless can use to exploit common- property resources for private gain. Based on the study most of the household though owning land left their livestock to fend for themselves on communal land.

[106] Cattle, sheep and goats are normally grazed on communal land owned by the village government. Those keeping chicken and pigs raised them on a free range basis; they were left to fend for themselves, requiring no extra land.

that households with more land had on average adopted fewer LS, although the relationship between a household's farm size and number of LS adopted was positive it was statistically insignificant (Appendix 5.4 shows the ANOVA results). While having more land does not affect the number of LS it does affect a household's ability to spread risk across a range of crops (food and cash) with different risk profiles, suggesting that while land is a constraint for on-farm activities, lack of land does not prevent households pursuing LS on common land such as livestock keeping (cattle, goats, sheep and chicken), petty trade and fishing.

Table 5.10: Diversification of household's LS by categories and number of LS adopted on basis of farmland characteristics

Diversification basis		Farm size		Household's farm fragmentation	
		Household has ≤ 2 ha (n = 102)	Household has > 2 ha (n = 98)	Single plot (n = 95)	Several plots (n = 105)
Households LS	Crop and livestock production	7 (6.9)	20 (20.4)	15 (15.8)	12 (11.4)
	Crop production and non-farm activities	50 (49.0)	27 (27.6)	39 (41.0)	34 (32.4)
	Crop, livestock production and non-farm activities	36 (36.3)	42 (42.9)	30 (31.6)	49 (46.7)
	Crop production only	9 (8.8)	9 (9.2)	11 (11.6)	10 (9.5)
Extent of diversification	Less diversified (1 to 2 LS)	50 (49.0)	49 (50.0)	44 (45.8)	54 (51.9)
	Moderately diversified (3 to 4 LS)	28 (27.5)	30 (30.6)	31 (32.3)	27 (26.0)
	Highly diversified (more than 4 LS)	24 (23.5)	19 (19.4)	21 (21.9)	23 (22.1)
	Average number of LS	**2.70**	**2.61**	**2.53**	**2.77**

Source: Own survey NB: numbers in brackets indicate percentage.

5.7 Household characteristics and diversification of livelihood strategies

As pointed out in section 5.0 many household characteristics can influence a household's choice of livelihood strategies. This section examines the relationship between a household head's age, education and gender and LS. The section further examines the relationship between a household's geographical location, its size and total income and adoption of LS.

Age of the household's head as mentioned in section 5.0 can influence a household's diversification of LS. Observations from the study show that younger heads were more diversified and we see this both in the number of crops grown (Table 5.7) and the spread of activities (Table 5.11). According to Table 5.11 a relatively higher proportion of households headed by younger heads reported adoption of livestock keeping and engagement in non-farm activities in addition to their crop production compared to households headed by both the middle (36 -59) and older heads (> 59). The Table further shows that a relatively higher proportion of households headed by heads between 36 and 59 years had crop production

as their only LS; this group reported a relatively higher proportion of households adopting livestock production and crop production as their LS compared to the younger and older headed households. Table 5.12 also shows households headed by younger heads adopted on average more LS as compared to those headed by heads aged between 36 and 59 and those above 59. Table 5.12 further shows that a relatively higher proportion of households headed by younger heads were in the highly diversified category (More than 4 LS) compared to the other two categories.

The above observation is supported by correlation results (Appendix 5.2) which show the existence of a negative but non-significant relationship between a household head's age and number of LS adopted. The negative correlation observed suggests that households with older heads adopted fewer LS. The influence of a household head's age on diversification of LS has also been reported by many[107]. For example Iiyama et al., have reported from their Kenyan study that while households with young heads (35 years) diversified into regular off-farm income generating activities, those with older heads (61 years) diversified into livestock keeping. Smith *et al.*, have also reported that younger men compared to the old were more involved in newer livelihood activities and that the old remained more in the more traditional non-manufacturing activities. The relatively higher diversification of households with young heads observed above may be attributed to them being more energetic, or even on the basis of the view of Block and Webb (2001) that households with young heads could have a relatively heavy burden of dependency from their children and at times their aging parents[108]. This assumption is also supported by Brons (2005), who reports from his study that men with young nuclear families and more young children often had better opportunities to develop supplementary activities. Other empirical evidence[109] shows that young adults are more involved in diversification of LS; they are normally more engaged in all types of non-farm activities compared with older individuals.

Education levels of household heads, according to section 5.0, can influence a household's diversification of LS. Results show that households with heads with 7 or more years of education generally spread risk across a range of activities both on-farm and off-farm. Table 5.11 shows the spread of risk by households through diversification of their LS, a relatively higher proportion of households with less educated heads reported engagement in crop production and non-farm activities compared to those with more educated heads. However, the latter reported a relatively higher engagement in livestock keeping and non-farm activities in addition to their crop production.

---

[107] Block and Webb, 2001; Smith *et al.*, 2001; Iiyama et al., 2008 and Babulo et al., 2008.

[108] In many parts of Tanzania the eldest son or youngest son, who is liable to inherit the home of his parents, has to live with his parents, taking care of them when they are less or no longer productive. At times even the other children male and female, though not living with their parents, still have to send remittances or food items to their parents.

[109] Unni, 1996; Bryceson, 1999; Barret et al., 2001; Babatunde and Qaim, 2009 and Démurger, et al., 2009.

Table 5.11: Diversification of household's LS by categories of adopted strategies

Diversification basis		Households livelihood strategy			
		Crop and livestock production	Crop production and non-farm activities	Crop, livestock production and non-farm activities	Crop production only
Household's head's age	Young household heads (up to 35 years) (n = 57)	6 (10.5)	21 (36.8)	28 (49.1)	2 (3.5)
	Medium aged household heads (35 to 59 years) (n = 111)	18 (16.2)	41 (36.9)	37 (33.3)	15 (13.5)
	Older household heads (over 59 years) (n = 32)	3 (9.4)	11 (34.4)	14 (43.8)	4 (12.5)
Household head's education	< 7 years of schooling/no formal education (n= 73)	8 (11.0)	33 (45.2)	23 (31.5)	9 (12.3)
	> 7 years of schooling or above (n = 127)	19 (15.0)	40 (31.5)	56 (44.1)	12 (9.4)
Household head's gender	Male (n = 169)	27 (16.0)	59 (34.9)	65 (38.5)	18 (10.7)
	Female (n = 31)	0 (0.0)	14 (45.2)	14 (45.2)	3 (9.7)
Households sale of crops	Household sales maize only (n = 18)	2 (11.1)	7 (38.9)	6 (33.3)	3 (16.7)
	Household sales other crops only (n = 36)	6 (16.7)	18 (50.0)	9 (25.0)	3 (8.3)
	Household sales both maize and other crops only (n = 133)	19 (14.3)	39 (29.3)	61 (45.9)	14 (10.5)
	Household does not sale any crops (n = 13)	0 (0.0)	9 (69.2)	3 (23.1)	1 (7.7)
Location	Rukwa region (n = 200)	27(13.5)	73 (36.5)	79 (39.5)	21 (10.5)
	Sumbawanga district (n =72)	9 (12.5)	30 (41.7)	28 (38.9)	5 (6.9)
	Mpanda district (n = 67)	12 (17.9)	23 (34.3)	23 (34.3)	9 (13.4)
	Nkansi district (n = 61)	6 (9.8)	20 (32.8)	28 (45.9)	7 (11.5)
	Average number of LS	**2..0**	**2.30**	**3.65**	**1**

Source: Own survey 2006, *NB*: numbers in brackets indicate percentage

Table 5.12 shows diversification of households' LS on the basis of the number of livelihood strategies adopted; the results show that households with less educated heads adopted on average fewer LS compared to those with more educated heads. The observation is supported by correlation analysis results (Appendix 5.2) which show that a significant (0.05 level) positive relationship existed between a head's education and number of LS suggesting that households with more educated heads were more likely to adopt many LS. This confirms the study's general observation that all heads with secondary school education despite all being employed did also participate in agricultural and other income generating activities. The observation is further supported by other research (see section 5.0) and the 2000/2001 Tanzanian integrated labour force survey, which showed that individuals with primary school education were better placed to get wage employment[110].

[110] However, things have since changed as currently most employers in the formal sector, including the central and local governments, only employ individuals with post primary education. The government has even gone further requiring that employees with only primary school education upgrade their education or face redundancy.

Table 5.12: Diversification of household's LS by number of strategies adopted

Characteristic		Less diversified (1 to 2 LS)	Moderately diversified (3 LS)	Highly diversified (4 or more LS)	Average number of LS
Household head's age	Young household heads (up to 35 years) (n = 57)	22 (38.6)	18 (31.6)	17 (29.8)	2.89
	Medium aged household heads (35 to 59 years) (n = 111)	63 (56.8)	27 (24.3)	21 (18.9)	2.53
	Older household heads (over 59 years) (n = 32)	13 (40.6)	13 (40.6)	6 (18.8)	2.69
Household head's education	< 7 years of schooling/no formal education (n= 73)	43 (58.9)	20 (27.4)	10 (13.7)	2.44
	> 7 years of schooling or above (n = 127)	57(44.9)	37 (29.1)	33 (26.0)	2.78
Households head's gender	Male (n = 169)	87 (51.5)	46 (27.2)	36 (21.3)	2.62
	Female (n = 31)	11 (35.5)	12 (38.7)	8 (25.8)	2.87
Households sale of crops	Household sales maize only (n=18)	11 (61.1)	4 (22.2)	3 (16.7)	2.44
	Household sales other crops only (n=36)	19 (52.8)	10 (27.8)	7 (19.4)	2.58
	Household sales both maize and other crops only (n=133)	63 (47.4)	39 (29.3)	31 (23.3)	2.70
	Household does not sell any crops	7 (53.8)	4 (30.8)	2 (15.4)	2.69
Location	Rukwa region (n = 200)	98 (49.0)	58 (29.0)	44 (22.0)	2.66
	Sumbawanga district (n =72)	32 (44.4)	24 (33.3)	16 (22.2)	2.78
	Mpanda district (n = 67)	36 (53.7)	17 (25.4)	14 (20.9)	2.55
	Nkansi district (n = 61)	30 (49.2)	17 (27.9)	14 (23.0)	2.64

Source: Own survey *NB*: numbers in brackets percentage

Gender as a factor influencing a household's diversification of LS is widely reported in literature[111]. For example Ellis, 1998 and Toulmin *et al.*, 2000 have shown that women's choice of livelihood options could be influenced by a community's predetermination of what activities are permissible to women and men. Similarly, Carswell (2002) has reported preferential differences in adoption of LS between men and women, for example while men preferred trade and casual work women's number one choice was trade. Smith *et al.*, (2001) also report from their Ugandan case study that men had a greater degree of occupational livelihood diversification compared to women, who were mainly involved in agriculturally related activities, alcohol brewing, handcraft making and farm labouring. According to Smith *et al.*, men were involved in carpentry, brick making and construction in addition to their traditional agriculture based livelihood activities. Babulo et al., point out that FHHs may be more likely to engage in informal activities such as producing and selling local beer or other food items, or the collection of forest products compared to MHHs.

While ANOVA results (Appendix 5.3) have shown a slight significant variation between FHHs and MHHs with regard to the number of crops grown, the variation between the two in relation to number of LS

[111] Scoones 1998; Ellis, 1998 and 1999; Toulmin *et al.*, 2000; Smith *et al.*, 2001; Carswell, 2002; Warren, 2002 Kaija, 2007; Lay et al., 2007 and Babulo et al., 2008.

adopted was insignificant (Appendix 5.4). However, about two thirds of FHHs reported adoption of three or more LS compared to less than half of the MHHs. Despite the above insignificance there were some relative differences between the two with regard to the spread of risk across activities (Table 5.13). According to Table 5.7 FHHs were more involved in food crop production as compared to MHHs[112]. Generally, Table 5.11 shows that none of the FHHs was totally dependent on crop production and that a relatively higher proportion of FHHs adopted in addition to crop production livestock production and non-farm activities as their LS. The Table also shows that MHHs reported a higher proportion of households adopting livestock production, non-farm activities and crop production as their LS. The types of LS adopted by both FHHs and MHHs are shown in Table 5.13, and according to the Table relatively higher proportions of FHHs had off-farm casual labour, petty trade, remittances and brewing and selling of local brew as their LS compared to MHHs. Relatively higher proportions of MHHs reported fishing, livestock keeping and trades such as carpentry, masonry, and welding as their LS relative to FHHs. Nevertheless, the observation that FHHs adopted on average more LS is contrary to some other studies which have shown that MHHs diversify more (Ellis, 1999; Lay et al., 2007)[113]. However, Kaija (2007) has reported a similar observation for a Ugandan case. The higher involvement in more LS by women observed could be due to the type, livelihood activities such as brewing and selling of local brew and petty trade (sale of vegetables, fruits, food and fish-mongering) are mostly done by women (Table 5.13). The Rukwa scenario is quite common in many parts of urban and rural Tanzania and it's only such areas as fishing, renting out of houses, masonry, carpentry, milling machines, and driving commercial vehicles that are male dominated. Others including livestock keeping are practiced by both males and females, though cattle ownership tends to be a male domain[114].

[112] According to the WB (2007) and Ellis (1988) as cited by Niehof (2004) most women in peasant societies play a key role in subsistence production as a duty for ensuring family survival.

[113] According to Ellis (1999) the differences in livelihood strategies observed between men and women arises from differential access to resources and opportunities between the two. He argues that women rarely own land, may have lower education due to discriminatory access as children, and their access to productive resources as well as decision-making tend to occur through the mediation of men.

[114] Warren points out that in certain circumstances women often play autonomous roles in livelihood diversification by undertaking their own small-scale enterprises. He adds that intermediate situations also exist in which women's engagement in market oriented activities is possible if it does not put traditional gender relations at risk.

Table 5.13: Distribution of reported livelihood strategies by household's head's sex, households income status and its sale of maize

Characteristic		Head's sex		Sale of maize	
		Male (n = 169)	Female (n = 31)	Yes (n = 150)	No (n = 50)
Household's reported livelihood strategies	Crop production	169 (100)	31 (100)	150(100)	50 (100)
	Salaried employment	8 (4.7)	2 (6.5)	5 (3.3)	5 (10)
	Off-farm casual work	49 (29)	11 (35.5)	40 (26.7)	20 (40)
	Petty trade	73 (43.2)	18 (58.1)	71 (47.3)	20 (40)
	Livestock keeping	91 (53.8)	13 (41.9)	87 (58)	17 (34)
	Fishing	11 (6.5)	0 (0)	7 (4.7)	4 (8)
	Remittances	27 (16)	8 (25.8)	23 (15.3)	12 (24)
	Preparation and sale of local brew	6 (3.6)	6 (19.4)	11 (7.3)	1 (2)
	Renting out rooms	1 (0.6)	0 (0)	1 (0.7)	0 (0)
	Grain milling shop	1 (0.6)	0 (0)	1 (0.7)	0(0)
	Carpentry/masonry/welding	5 (3)	0 (0)	4 (2.7)	1 (2)
	Traditional healing	1 (0.6)	0 (0)	0 (0)	1 (2)
Average number of LS adopted		**2.62**	**2.87**	**2.67**	**2.60**

Source: Own survey NB: numbers in brackets indicate percentage.

Access to markets has also been shown to influence rural households' ability to diversify into non-farm income earning opportunities (Smith et al. 2001 and Lanjouw et al., 2001). As pointed out in Box 5.2 income from crop sales could be very instrumental for a household's entry into non-farm LS. Table 5.13 shows that households selling maize had on average adopted slightly more LS compared to those not selling. The Table also shows that households selling maize were relatively more diversified into petty trade and livestock keeping, and these households also reported less reliance on off-farm casual work and remittances as LS compared to those not selling maize.

Table 5.14 additionally shows the general distribution of households to LS on basis of their participation in crop sales. Generally, a relatively higher proportion of those selling maize and other crops in addition to crop production adopted livestock and petty trade as a LS compared to those selling maize only, other crops only and those not selling any crops. The Table also shows that a higher proportion of those not selling any crops at all reported off-farm casual work and remittances as LS.

Table 5.14: Distribution of reported livelihood strategies by their crop sale characteristics

Characteristic		Household's sale of crops			
		Maize only (n = 18)	Maize and other crops (n = 133)	Other crops only (n = 36)	Does not sale any crop (n = 13)
Household's reported LS	Crop production (n=200)	18 (100)	133 (100)	36 (100)	13 (100)
	Salaried employment (n=10)	1 (5.6)	4 (3.0)	5 (13.9)	0 (0)
	Off-farm casual work (n=60)	5 (27.8)	35 (26.3)	13 (36.1)	7 (53.8)
	Petty trade (n=91)	6 (33.3)	66 (49.6)	16 (44.4)	3 (23.1)
	Livestock keeping (n=104)	7 (38.9)	80 (60.2)	14 (38.9)	3 (23.1)
	Fishing (n=11)	1 (5.6)	6 (4.5)	1 (2.8)	3 (23.1)
	Remittances (n=35)	2 (11.1)	22 (16.5)	6 (16.7)	5 (38.5)
	Preparation and sale of local brew (n=12)	2 (11.1)	9 (6.8)	0 (0)	1 (7.7)
	Renting out rooms (n = 1)	1 (5.6)	0 (0)	0 (0)	0 (0)
	Grain milling shop (n =1)	0 (0)	1 (0.8)	0 (0)	0 (0)
	Carpentry/masonry/welding (n=5)	1 (5.6)	3 (2.3)	1 (2.8)	0 (0)
	Traditional healing (n=1)	0 (0)	0 (0)	1 (2.8)	0 (0)
Average number of LS		**2.44**	**2.70**	**2.58**	**2.69**

Source: Own survey NB: numbers in brackets indicate percentage.

Despite the above observations, the study was unable to observe any significant variations (Appendix 5.4) in the average number of LS adopted on the basis of households' sale of both maize and general crop sales. Nevertheless, as shown in Table 5.14 households selling maize only reported a relatively lower average of 2.44 LS compared to those selling other crops only and those not selling any crops at all whose average LS were 2.58 and 2.69 respectively. Households selling both maize and other crops adopted on average 2.70 LS. Based on the above data and its limitations, the study's simple assumption at this point would be that households not selling any crops diversified relatively more than those selling maize only or other crops only, as a way to earn the income foregone by not having either surplus maize or other crops they could sell to earn some income..

Geographic location can influence a household's diversification of its LS through access to markets or availability of other income generating opportunities or even access to infrastructure (see section 5.1). Generally, adoption of LS by households in Rukwa region seems to be similar across its rural districts. However, some minor differences were observed, as shown in Table 5.10. A relatively higher proportion of households in Sumbawanga adopted crop production and non-farm activities as their LS compared to Mpanda and Nkansi. Table 5.10 also shows that a relatively higher proportion of households in Nkansi reported crop, livestock production and non-farm activities as their LS and a slightly higher proportion of households in Mpanda reported reliance on crop and livestock production as their LS. In addition to the above, Table 5.12 shows that slightly above fifty percent of households in Mpanda district fell under the less diversified category by adopting one or two LS . Table 5.12 also shows Sumbawanga district had a relatively higher proportion of households in the moderately diversified category compared to the other two; Sumbawanga also reported a marginally higher average number of LS.

The similarity in adoption of LS by households across the districts is supported by ANOVA results (Appendix 5.4), which show the observed variations to be statistically insignificant. A simple explanation at this juncture due to data limitations is that the three districts had more or less similar opportunities of LS. Although Sumbawanga is closer to the regional administrative capital (Sumbawanga Municipality), the district lacks industries or other financial and service sectors that could adequately absorb surplus labour from the agricultural sector. All the districts are also connected to other regions through unpaved roads. The only major difference between Sumbawanga district and the others is that it has two water bodies in which households could engage in fishing, and as shown in Table 5.7 all households reporting fishing were from that district. Nevertheless, Mpanda's relatively higher proportion of households in the less diversified category could be because more than two fifths of them were involved in tobacco farming; most households growing tobacco had only one or two livelihood strategies. The study assumes that farmers growing tobacco may earn enough income to enable them meet their household needs without the need for much diversification. Since tobacco farming is quite a labour intensive activity, farmers may lack the time and energy to work on other LS, given the fact that they also engage in maize production, which some households use only for food while others sell the surplus for extra cash. The current study looked at diversification from a broad perspective with crop farming characterized as a LS. Whereas tobacco farmers may not diversify into many LS, their crop diversification may provide the extra income required for the well-being of households.

Household size is another factor shown by literature to influence a household's diversification of LS[115]. Both Barrett et al. and Minot et al. argue that larger households with less land to work on are prone to diversify into off-farm income generating activities. Minot et al., add that households with a high proportion of working age adults have greater chances of diversifying into off-farm activities, and it is assumed that a large number of working adults would be associated with abundant skills fit for off-farm income generating activities. According to Brons, households with more members have general flexibility in participating in supplementary activities.

Table 5.15 suggests a higher involvement of smaller households in crop production and non-farm activities compared to the medium and larger ones. The table also shows that a relatively higher proportion of medium sized households adopted crop, livestock production and non-farm activities as their LS compared to the small and large sized households. Although lower proportions of all households relied on crop production only, a relatively higher proportion of larger households relied on it. As regards the average number of LS adopted on basis of household size, the Table shows that a higher proportion of smaller households were in the less and medium diversified categories as compared to the medium and larger ones. This observation is supported by correlation analysis results (Appendix 5.2) which show

[115] Barrett et al., 2001; Brons, 2005; and Minot et al., 2006.

existence of a positive relationship between household size and number of LS adopted. Appendix 5.1 also shows that the number of children under 15 years was positively correlated to the number of LS adopted. However, both the above coefficients were small and statistically insignificant.

The above observations seem to deviate from the general theory that rural households with many members[116], particularly households dependent on agricultural production, stand a better chance of having enough labour for their agricultural production, and even to use their excess labour for diversification into LS compared to those with less labour. The current study suggests that this might not always be true, in part because households with sufficient income can hire the labour they need to manage their agricultural production or engage in other LS, whereas larger households may not always be able to use their additional labour effectively or at all. The lack of a significant correlation and thus lack of variation amongst households could also be due to the fact that it is quite normal for many children under the age of fifteen to participate in a household's agricultural and non-farm income generating activities. The contribution of children to household's well-being in Tanzania is acknowledged by the 2000/2001 Tanzanian integrated labour force survey (Appendix 5.9), which shows that 39.6% of children aged between 5-17 years were reported to engage in economic activities. Whereas the proportions were low in urban areas it was relatively high in rural areas; while in Dar es Salaam's and other urban areas it was 6.5% and 20 % respectively, rural areas reported 45.7%.

Table 5.15: Household size and diversification of household's LS by categories and number of LS adopted

		Household size		
		Small sized (≤ 4 members) (n = 65)	Medium sized (5-6 members) (n = 61)	Large sized (> 6 members) (n = 74)
Households LS	Crop and livestock production	9 (13.8)	7 (11.5)	11 (14.9)
	Crop production and non-farm activities	31 47.7)	20 (32.8)	22 (29.7)
	Crop, livestock production and non-farm activities	21 (2.3)	27 (44.3)	31 (41.9)
	Crop production only	4 6.2)	7 (11.5)	10 (13.5)
Number of LS	Less diversified (1 to 2 LS)	32 (49.2)	29 (47.5)	38 (51.4)
	Moderately diversified (3 to 4 LS)	24 (36.9)	18 (29.5)	16 (21.6)
	Highly diversified (more than 4 LS)	9 (13.8)	14 (23.0)	20 (27.0)
	Average number of LS	**2.58**	**2.72**	**2.66**

Source: Own survey NB: numbers in brackets indicate percentage.

[116] Galab, et al., (2006) have reported that a household's ability to supply its own labour supply is an important factor shaping livelihood diversification strategies, particularly among poor households. They also point out that households with more able-bodied members are capable of diversification into multiple activities.

5.8 A comparison of crop diversification for households that were in maize production in 1986

This final section seeks to shed light in changes on crop diversification for households that were in maize production in 1986 at the onset of the agricultural reforms and liberalization of the maize market. Many countries in Latin America, Asia, Africa and Eastern Europe have recently undertaken market reforms aimed at opening up their economies through trade reforms, which have generally involved both international and internal/domestic trade and marketing. Tanzania carried out the reforms in both the agricultural and non-agricultural sectors. In principle the presence of well functioning markets should encourage specialization, but the absence of markets or presence of barriers to accessing crop markets may lead households to continue diversifying their crop production. From evidence of the present research on both crop and LS diversification (sections 5.3 and 5.4) it could still be argued that many countries, firms and farm households within countries that have reformed their economies and trade continue to diversify their production. It could be explained that continued diversification is a product of opportunities created by the economic and trade reforms, which firms and farm households exploit (Balihuta, and Sen, 2001 and Thanh, *et al.*, 2005). As explained earlier, not all households involved in the study were producing maize at the onset of the reforms. Comparing crop production between 1986 and 2005 could shed some light on whether households producing maize in 1986 have abandoned some of the crops they were growing then or whether they have indeed adopted more new crops. Due to problems of recall data pointed out in Chapter Three and in the absence of disaggregated data, there is a need for some caution when interpreting results presented here. In making the comparison the section mainly examines the number of crops grown by households and examines allocation of farm land by households to maize production, food crops in general and cash crops. The emphasis on maize is due to its importance as a staple to households in Tanzania at large.

Generally, observations suggest some shift in importance of crops cultivated by households over time. Table 5.16 shows there has been a small reduction in the proportion of households growing maize only, and those growing maize and beans have increased. There is also an increase in the proportion of households growing maize, beans and sunflower. While beans have always been an important crop in Tanzania as a source of protein to millions of poor households, the demand for sunflower and other oil seeds has been rising due to an increase in the number of cooking oil factories in Tanzania following the adoption of market reforms.

Table 5.16: Crop diversification combinations by households in production in 1986

Crop production combinations	1986 (n = 87)	2005 (n = 87)
Maize only	12 (13.79)	9 (10.34)
Maize and beans	4 (4.6)	12 (13.79)
Maize and rice	2 (2.3)	3 (3.45)
Maize and cassava	8 (9.2)	5 (5.75)
Maize and sunflower	0 (0)	3 (3.45)
Maize and tobacco	4 (4.6)	3 (3.45)
Maize beans and sunflower	2 (2.3)	8 (9.2)
Maize, millet and beans	9 (10.34)	1 (1.15)
Other crop combinations	46 (52.87)	43 (49.43)
Average number of crops grown	2.79	2.70

Source: Survey data 2006; *NB*: Numbers in brackets refers to percentage.

The shift in importance of crops cultivated is supported by Table 5.17, which shows households allocated more land to cash crops in 2005 compared to 1986. The Table further shows that whereas the amount of land allocated to maize production and cash crops was higher in 2005 than 1986, the proportion of farm land allocated to other food crops was lower in 2005 than 1986. According to a paired sample t-test, both the increase and reduction in proportion of land allocated to cash crops and other food crops was significant (0.05 level) (Appendix 5.10). The change in amount of farm land allocated to cash crops shows that households may have been tempted to shift into production of higher value crops in response to the developing markets following trade liberalization. In general the average number of crops grown by households did not vary between the two periods (Table 5.17). These observations are suggestive of some changes but not conclusive. Lack of good panel data means the study could not come up with convincing explanations for these results.

Table 5.17: Crop diversification by number of crops and farm allocation

Diversification basis		Year	
		1986	2005
Number of crops	0	0 (0.0)	1 (1.1)
	1	12 (13.8)	9 (10.3)
	2	29 (33.3)	33 (37.9)
	3	27 (31.0)	23 (26.4)
	More than 3	19 (21.8)	21 (24.1)
	Average number of crops	2.79	2.70
Farm allocation	% of farm land allocated to maize	56.18	60.66
	% of farm land allocated to other food crops	35.91	25.47
	% of farm land allocated to cash crops	7.91	13.87
	Average farm size	2.23	2.46

Source: Survey data 2006; *NB*: Numbers in parentheses refers to percentage

5.9 Conclusions

The chapter has examined crop and livelihood diversification of households in Rukwa to determine the nature of both on-farm and off-farm diversification among farm households, in the context of 20 years of agricultural and other socio-economic reforms. It also aimed to establish the importance of staples (i.e. maize) to the LS, and how LS vary across key farm and household characteristics. In meeting the above objectives, diversification of LS was examined on the basis of a household's activity portfolios and income sources, and the relative diversity of sub-sectoral farm enterprises, enabling diversification to be measured by considering both a households engagement in farm and non-farm activities and the number of LS adopted. Crop diversification was measured on the basis of number of crops grown by households as well as the share of land used for different crops i.e. food versus cash crops. The use of number of LS and crops was mainly determined by their relative ease of application (Minot, 2006) and also by data limitations. However, information on number of crops or LS may not always give a correct account of how households spread their risks across LS or crops grown. For example one farmer may grow many low-value crops and earn less income compared to another that grows few crops of higher value; the same point applies to LS.

The chapter has observed that maize continues to play a significant role in the livelihoods of households in rural Rukwa; it is important for everyone, overall and in each district. Generally, maize was not only important to households growing it for food and cash, but also to those with opportunities to grow traditional cash crops like tobacco as is the case for Mpanda. This observation is in line with the DFID livelihood framework (see Section 5.1) which puts food security among the major outcomes of households' choice of livelihood strategies. Thus, maize not only ensures a household's food security but also meets another important outcome: providing households with income. The importance of food security to

households is further stressed by the study's observation that female headed households, despite on average owning less land than male headed households allocated on average relatively more of their land to food crop production. The role of women in food security has also been reported in literature (Gittinger et al., 1990 and FAO, 2005).

The study finds that households' farm sizes were the major determinant of its crop diversification in 2005: those with more land were able to grow more crops and also allocate more land to cash crops, compared to those with less land. This observation supports the hypothesis that households with larger farms are more able to diversify by adopting new crops compared to those with smaller farms. Apart from farm size other factors that may have influenced crop diversification in the study area are the different agro-ecological zones (Appendix 3.1) and possibly food preferences of the different ethnic groups found in Rukwa (Chapter Three): in addition to maize some ethnic groups might grow millet or cassava as part of their traditional staple.

The chapter also concludes that age was an important factor influencing both a household's diversification of crops grown and their LS. Households headed by younger heads grew on average more crops than those headed by older heads, they also allocated less land to maize production both as a proportion of their farm and as a proportion of land allocated to general food production. Generally, the younger heads adopted on average more LS than older heads, supporting literature[117] which shows that young adults are more involved in diversification of LS, engaging more in all types of non-farm activities compared with older individuals.

Finally, an examination of households' LS has shown that in addition to crop production other important livelihood strategies included livestock keeping, petty trade, and provision of casual labour. The observed diversification could perhaps be seen as a contradiction to predictions by supporters of economic reforms that such reforms would allow specialization. Nonetheless, it confirms observations from literature[118] showing that diversification of LS by households is a normal thing. While in some situations households may diversify to insure themselves against shocks, in others it is a coping strategy in situations of economic or environmental uncertainties.

[117] Unni, 1996: Bryceson, 1999; Barret et al., 2001; Babatunde and Qaim, 2009 Démurger, 2009.
[118] Ellis 1998, Carswell 2000; Deb et al., 2002; OPM 2004 and 2002; Kejala et al., 2006; and Reardon et al., 2007.

Chapter Six

Crop production in Rukwa region

6.0 Introduction

Agriculture is Rukwa's economic backbone, with about 90% of the region's economically active population engaged in it. According to URT et al. (2004), agricultural production accounts for about 65% of the region's GDP. The major crops grown by households in Rukwa include food crops such as maize, finger millet, beans, rice, and cassava; and cash crops such as tobacco, sunflower, groundnuts, coffee and wheat.

Despite the diversity of crops cultivated in Rukwa, most of the region's cash income comes from maize, which accounts for 35% of the region's total annual food output (URT et al.). Rukwa's maize production and its overall contribution to Tanzania's total maize output over the past years led the region along with three other regions, Iringa, Mbeya and Ruvuma to be nicknamed "the big four" (URT et al.). Rukwa, however, is different from the others, being much more remote (see map, page 25) and its farmers have less access to commercial markets for outputs and inputs[119]. Furthermore, Rukwa is more reliant on maize as a source of income than other regions (URT et al.), which have other crops such as tea, coffee, oil palm, and bananas (Mbeya), coffee and tobacco (Ruvuma) and Irish potatoes, tea, and coffee in Iringa (NBS et al.,, 2006).

The aim of this chapter is to explore factors related to farm output, productivity and marketing of key crops. This is an important question because raising outputs and productivity and improving access to markets are thought to be key in the drive towards reducing poverty (IFAD, 2001, World Bank, 2007) and Tanzania has experienced policy reforms aimed at stimulating market incentives and opportunities. Chapter Two (section 2.3.1) showed that farm households producing crops face constraints that can broadly be categorized into three classes; farm-related, household-related and those related to location. Farm-related constraints include small farm sizes, low soil fertility; poor technologies used in land preparation, high weed intensity and low access to agricultural extension services. This chapter aims to explore these in the Rukwa case-study. In addition it investigates the marketing of maize, exploring the patterns of marketing, different types of buyers and whether prices offered to maize producing households varies by type of buyer. These questions are particularly relevant in the context of 20 years or more of agricultural reforms, which were intended to stimulate access to inputs, improve market access and provide incentives to farmers to increase productivity. Much of the analysis will focus on maize with a briefer analysis of other

[119] Compared to Rukwa, the other three regions have some better road networks with some or many of the roads having tarmac (asphalt) (see map, page 25). Iringa and Mbeya are also well served by the Tanzania Zambia Railway line (TAZARA) which connects Dar es Salaam Tanzania's commercial capital to Kapiri Mposhi in Zambia, providing a good way of transporting food, cash crops and other commodities from the regions. Ruvuma can also easily access TAZARA through Makambako in Iringa region which is not very far from Songea the regions capital.

food crops and cash crops. Generally, this chapter examines production of the six selected crops determining their output (total kilograms produced) and productivity measured as yield per unit of land (kg/ha).

The following analysis is based on farm household data collected during the fieldwork, and supported by comparison with estimates of output and yields in Rukwa from the official statistics. It begins by explaining the conceptual framework for measuring yields. Section 6.2 provides an overview of crop production levels and trends, compares survey estimates to official estimates, and puts Rukwa in the contexts of Tanzania and of other countries. Section 6.3 examines maize production in detail; levels and trends, factors influencing households' maize production in 2005 and constraints faced by farm households producing maize in Rukwa. Lastly, section 6.4 examines maize marketing by the households, respondents' opinions on maize marketing in their area and their general views on liberalization of the maize market.

6.1 The conceptual framework

Measuring productivity

The OECD (2001:11) has defined productivity as "a ratio of a volume measure of output to a volume measure of input use". It points out that although there is general agreement on the notion, literature on productivity shows that defining of its purpose and how to do it vary. The OECD adds that the objectives of productivity measurement include to trace technical change (technology); to identify changes in efficiency; to identify real cost savings in the production process; to express production in physical units (e.g. cars per day, passenger-miles per person) (benchmarking production process); and to determine living standards for example through per capita income.

In meeting the objectives the OECD states that many measurement methods can be employed; the choice of method normally depends on the purpose of the productivity measurement and availability of data. According to OECD (2001:12) productivity measures could broadly be classified as single factor (relating a measure of output to a single measure of input) or multifactor (relating a measure of output to a bundle of inputs). An alternative distinction of particular relevance at the industry or firm level is between productivity measures that relate some measure of gross output to one or several inputs and those which use a value-added concept to capture movements of output.

Determining crop yields of the surveyed households'

Using the above conceptualization of productivity and how it's measured, the current study sought to determine the surveyed households' crop productivity on the basis of crop yield (output per unit of land used i.e. kg/ha). It is a measure of land productivity which does not include other important inputs such as labour, and other forms of capital, including purchased inputs such as seeds and fertilisers. This was

chosen as the most simple and commonly used method (Diskin, 1997 and Fan and Chan-Kang 2005), and best suits the type of data collected by the study. The study was unable to collect detailed information on other inputs such as labour and technology (seeds, fertilizers and pesticides/insecticides) which could have enabled determination of productivity in another way. Weibe (2003) points out that land productivity can help in the determination of total food output among others. However, the study considered that determining land productivity could be complicated depending on how one defines output and area. Dyer (1991) for example argues that using net output, i.e. the value of output minus purchased inputs, may lead to faulty conclusions that small farmers are more productive than large farmers, because small farmers are less likely to purchase inputs, using instead saved seeds, animal fertilisers, and family labour. Land area could refer to total farm size, cultivated area, or gross cultivated area (which includes cultivated area plus parts of the cultivated area that are multi-cropped or used more than once). Because of the difficulty in collecting costs of other inputs, this study uses gross output, measured in kilograms. Area is defined as cultivated area for each crop and does not include the possibility of land being cultivated more than once in a year. Furthermore, Rukwa the area of study is a uni-modal area and irrigation at present is limited.

As earlier pointed in chapter five, a major emphasis will be put on the surveyed households maize yield and output and briefly examines production of rice, beans, groundnuts, sunflower and tobacco. The study used both primary, secondary data and qualitative information gathered through individual interviews and FGDs; as well as basic data on production levels, land used and yields from the MAFC. Depending on suitability it uses summary statistics, correlation analysis, and regression analysis to present results. Whereas the correlations aim at testing for association between certain continuous variables for example age and crop yields/productivity, regression analysis aimed to investigate the role of several factors influencing surveyed households maize yield and output in 2005. The summary statistics, correlation and regression results are supported by qualitative data whenever possible.

6.2 An overview of crop production by households

The section gives an overview of the surveyed households' production of maize, rice, beans, groundnuts, sunflower and tobacco. The section draws on information generated from the individual interviews and data from Basic Data Agriculture and Cooperatives Sector 1998/99 – 2004/05 (URT, 2006). Most if not all the surveyed households practiced crop diversification and among other crops the above mentioned crops were cultivated, however, tobacco was only cultivated in Mpanda district (section 5.3). Production of the above mentioned crops will briefly be looked at in sub-sections 6.2.1 and 6.2.2 below.

6.2.1 Production of food crops

This sub-section assesses yield and output levels of the three popular food stuffs, maize, beans and rice; maize production is covered in more detail in section 6.3. Production of beans in Rukwa according to URT et al. (2004) has been a long standing practice for food and as a cash crop; in instances of maize market

failures some farmers quickly switch to beans and finger millet, which was Rukwa's traditional staple before the introduction of maize in the early 1970s. Rice according to URT et al., (2004) is the most important crop for farm households in the Rukwa Valley and because it is grown on wet soils it poses no competition for land to crops such as maize, beans or cassava.

Table 6.1 shows that the yield levels for maize, rice and beans reported by the surveyed households were slightly lower than the official estimates for Rukwa (URT/MAFC, 2006). However, the official regional estimates also include farm production in Sumbawanga Urban district, which was not covered by the study[120]. This may explain discrepancies between the study's estimates of yields and those of the official estimates for Rukwa. The discrepancies suggest that the study may not have succeeded in obtaining a truly random sample; however the closeness of the estimates is encouraging[121].

For rice the official yield estimates reported for Rukwa (Table 6.1) are low compared to levels shown in other parts of Tanzania, for example Arusha and Kilimanjaro regions (Appendix 6.1). Kadingi *et al.*, (2004) have also reported levels of 3000 kg/ha for households in Usangu plains in Mbeya region, again marking Rukwa out as different from the other members of the 'big four'. According to Kadingi *et al.*, households using mechanization, fertilizers and hired labour were able to produce relatively higher yields of rice as compared to those using less. Generally, use of these was very low, or nonexistent in the case of tractor use, possibly explaining why Rukwa yields are lower than those observed by Kadingi et al. Rukwa's average rice yield is relatively lower than levels reported for eastern Africa and other parts of the world (Appendix 6.2).

The 2004/05 bean yield levels reported for Rukwa are also relatively lower than levels reported for Arusha, Iringa and Ruvuma regions (Appendix 6.1). According to NBS et al. relatively higher yield levels of 680 kg/ha and 540 kg/ha were reported for Mtwara and Kagera regions respectively. The 2004/05 rice and beans yield levels (Table 6.1) reported for Rukwa are also quite low in comparison to levels reported for other developing countries in other regions of the world (Appendix 6.2).

[120] The study also looked at data from the individual districts but found a lot of errors and inconsistencies, for example, the same numerical values reported for output and area cultivated in some years.
[121] The households bean yield level of 446.55 kg/ha observed was relatively close to the 460 kg/ha reported for Rukwa in the 2002/03 by the National Sample Agriculture Census (NBS et al., 2006), two years earlier.

Table 6.1: Crop yield levels of selected food crops in Rukwa and the surveyed households for the 2004/05 season

Characteristic		Average yield (kg/ha)	
		Rukwa[122]	Surveyed households
Food crops	Maize	1203.32	1057.00
	Rice	1761.95	1535.68
	Beans	679.91	446.55
Cash crops	Groundnuts	473.61	552.50
	Sunflower	784.54	634.20
	Tobacco	1073.32[a]	794.05

Source: Data for Rukwa comes from the Basic Data Agriculture and Cooperatives Sector 1998/99 – 2004/05 (URT, 2006), and surveyed households data is from own survey 2006. ***Nb***: [a] This is an estimate from the district agricultural office in Mpanda.

6.2.2 Production of cash crops

This section examines the production of groundnuts, sunflower and tobacco, the three popular cash crops reported by the surveyed households in 2005. However, tobacco was only cultivated in Mpanda and was the district's most important cash crop.

Generally, Rukwa's major cash crops include groundnuts, sunflower, tobacco, coffee and wheat URT et al., 2004). According to URT et al., (2004) groundnut production is a long established activity in Mpanda relative to Sumbawanga and Nkansi districts, accounting for about 31 % of Rukwa's cash crops grown. Sunflower is grown in all districts and its popularity is increasing; its harvests have increased from about 12,140 tons in 1996/97 to 22,027 tons in 2002/03.

Tobacco was introduced in the region (Mpanda) in the late 1990's, but its expansion has been limited due to high labour requirements and the amount of firewood required for curing (URT et al). They further point out that, at its present production levels of about 3,000 tons its contribution to the regional economy is minimal. Coffee as a cash crop was recently introduced to Rukwa and its production is currently limited to Mwese highlands in Mpanda district. According to URT et al., its role in the region's economy is currently insignificant; in 2003 the region had a total land area of 329 ha only dedicated to coffee production. Lastly, wheat as a cash crop has been grown for a long time on a small scale on the Ufipa plateau; from 1996/97 to 2002/03 its production has stood at an average of 1,688 tons per year.

Table 6.1 shows that whereas the observed yield level for groundnuts for 2005 was slightly higher than the official estimates for Rukwa that for sunflower was relatively lower. Again, the inclusion of the Sumbawanga urban district in the official statistics would lead me to conclude that the estimates obtained from the households are reasonably reliable. According to Table 6.1 the 2005 observed yield for tobacco was lower than that obtained from the district agricultural office which the study was unable to compare

[122] Figures for Rukwa also include data from Sumbawanga Urban district, which was not covered by the study.

with the official estimates. However, the tobacco yield level obtained from the district office seems to be similar to that observed for Rukwa in the National Sample Agriculture Census of 2002/03 (NBS et al., 2006). According to NBS et al., other regions in Tanzania recording a yield level of 1000 kg/ha were Arusha and Shinyanga regions; this yield was the highest in the whole country (Appendix 6.1)[123].

Generally, the yield levels for groundnuts and sunflower seed observed for Rukwa (Table 6.1) are relatively low in comparison to levels reported elsewhere in the world (Appendix 6.2), for example FAOSTAT data shows that the averages for sunflower for the period 2000 – 2005 were 1291.08 kg/ha, 1141.46 kg/ha, 1684 kg/ha, and 1224.42 kg/ha for Southern Africa, Eastern Europe, South America and the World respectively. Therefore, this observation suggests that there is a lot of room for improvement if farm households in Rukwa are to reach the average world yield levels of the crop. Despite the fact that Rukwa's tobacco yield is high by Tanzania standards, it is quite low when compared to other parts of the developing world (Appendix 6.2). For example yield levels of; 1238.58 kg/ha, 2103.8 kg/ha, and 2103.8 kg/ha have been reported for Eastern Africa, Southern Africa and Asia respectively (Appendix 6.2). All the above data giving low yields across a range of crops suggests that there are particularly severe problems in Tanzania, and in Rukwa compared to the rest of Tanzania. The study observations suggest that farmers in Tanzania face many constraints in increasing yields. Therefore, the following section while examining Rukwa's maize production in detail and also examines the major constraints to its production.

6.3. Maize production in Rukwa

This section examines the surveyed households' maize production in the context of 20 years of agricultural reforms. Sub-section 6.3.1 begins by examining farmers' own views about the importance of maize and the levels of maize production recorded in 2005. In sub-section 6.3.2 the study examines constraints facing maize farmers in Rukwa. Lastly, sub-section 6.3.3 presents the results of a regression analysis that aims to assess how important individual constraints are and to shed light on some of the debates referred to in the introduction to the chapter.

6.3.1 Levels and trends of maize production

Maize is an important crop to most households in Rukwa and Box 6.1 illustrates this with some quotes from participants in the FGDs. Maize is consistently ranked as one of the most important to crops to cultivate, and farmers refer to its dual use as a food crop for family consumption and a source of income. Only where cash crops – i.e. tobacco – are well established does maize have less importance, and even the possibility of cultivating higher return crops such as beans does not diminish the importance of maize. This sub-section examines the surveyed households' 2005 maize production. Generally, apart from the difference in maize's importance in Mpanda relative to Sumbawanga and Nkansi, all the FGDs (eight) in

[123] Because the study was unable to get official estimates for tobacco production for the season 2004/05, it is assumed that the figures obtained from the district offices could for the time being be relied upon.

Sumbawanga and Nkansi ranked maize as the number one crop in their areas followed by beans and sunflower in third position. One FGD put finger millet at number three. The FGDs that ranked maize as the most important crop based their arguments on its importance both as their main staple and for its income earning ability when surplus production is sold. According to the FGDs participants all age groups and sexes were equally involved in its production.

Box 6.1: Importance attached to maize by rural households in Rukwa

'The most important crops in our area are maize, sunflower, beans, groundnuts and finger millet. However, maize ranks number one followed by beans, sunflower, finger millet and groundnuts, and this is because to us, maize is first and foremost our staple and can also be sold to earn cash. Furthermore though beans fetch higher prices only a few of us cultivate the crop" (Focus group discussion male participant above 35 years from Sandulula village, Sumbawanga district, 5/10/2006).

In Mpanda district maize production according to the FGDs was mainly important as a source of food rather than cash. In this district, tobacco production was their major source of cash. However, not all households grow tobacco, as respondents indicated in questionnaires. Reasons for non-participation in tobacco production included religious beliefs; for example one participant in the FGDs said he does not grow tobacco because he is a born- again Christian and to him smoking is not 'good', so his family cannot engage in tobacco production although some of those producing the crop earning substantial amounts of cash. Thus, maize keeps its importance as a source of cash for this group. The following quotation shows the importance of tobacco as a cash crop in Mpanda district,

"In our area, the major crops grown include tobacco, maize, beans, groundnuts, rice, cassava, sorghum and finger millet, and tobacco ranks first among all these for households interested in commercial agriculture. Maize comes second due to its importance for farm households' food security". (Focus group discussion male participant above 35 years from Ifukutwe Village in Mpanda district, 10/10/2006).

"The major crops grown in our area include maize, finger millet, sunflower, beans, ground nuts, sweet potatoes, potatoes and cassava. And among these, maize is the most important crop, followed by beans and finger millet. Maize is more important because it is our main staple crop and it's the most cultivated crop in our area". (FGD No 14 female participants over 35 years of age from Londokazi village, Nkansi district, 18/10/2006)

The generally greater importance of maize to farmers in Nkansi and Sumbawanga illustrated above is supported by the quantitative estimates of maize output and area cultivated with maize. Table 6.2 shows that the 2005 averages of 1237.99 kg/ha and 2020.34 kg for maize yield and output respectively observed for households in Nkansi district were relatively higher than the averages observed for both Sumbawanga and Mpanda districts. The Table further shows that about half of the surveyed households producing maize in 2005 had farm sizes larger than 2ha and less than fifty percent of households had their farms as a single unit. The observation that yields are highest in Nkansi, where average farm size is slightly larger than elsewhere, suggests that small farms are not more productive. However, this remains to be formally tested in the regression model that follows, as it is possible that the higher yields in Nkansi are explained by other factors.

Table 6.2: Households' maize production in Rukwa for the 2005 cropping season

Characteristic		Rukwa Region (n = 191)	District		
			Sumbawanga (n = 66)	Mpanda (n = 66)	Nkansi (n = 59)
Average households' total maize production (kg) in 2005		1460.10	1420.00	999.39	2020.34
Average households' maize yield (kg/ha) 2005		1057.48	990.12	963.47	1237.99
Average farm size (ha) under maize production		1.31	1.35	1.12	1.47
Is crop farm a single plot of land	Yes	91 (47.6)	22 (33.3)	33 (50)	36 (61)
	No	100 (52.4)	44 (66.7)	33 (50)	23 (39)

Source: Own survey 2006, ***NB***: Numbers in brackets indicate percentage

The remainder of this sub-section examines how maize is grown in each of the districts with the aim of highlighting constraints and also possible differences across the districts. Table 6.3 contains summary statistics on the use of a range of modern farm inputs and technologies.

With respect to use of improved technologies, generally, the results show their use in maize production in 2005 was low; most households relied on traditional seeds and recycled hybrid seeds[124]. The table further shows that only about ten percent of the households bought improved seeds from stockists every year. This observation is partly supported by NBS *et al.*, (2006) who on the basis of the 2002/03 National Sample Census of Agriculture report that only 18% of crop growing households in Tanzania used improved seeds and only 5 % of households in Rukwa used improved seeds. The study's estimate of 9.9 % for use of improved seeds by the surveyed households is of a similar magnitude to the official estimate for Rukwa. Lastly, the Table shows that most of the households relied on the hand hoe in their land preparation.

Table 6.3 also shows that use of fertilizers was limited amongst the surveyed households[125]. The low use or total non-use of chemical fertilizers by the surveyed households was caused by many factors (see Box 6.2). Generally, study observations suggest a variation of reasons between age groups with regards to their non-use of fertilizers; while many elderly and middle-aged respondents based their arguments for not using fertilizers on their experiences and traditions, the younger blamed non-use on unavailability and lack of money. Some younger respondents were also caught up with the problems of traditions and customs of their communities. However, all the respondent categories were equally affected by the price of fertilizers and economic hardships as factors hindering their use of fertilizers in maize production, as shown by the quotations in Box 6.2. The information provided in Box 6.2 gives a mixed picture; whereas some respondents seem very genuine in their concern given the economic and infrastructural conditions of

[124] Due to the low yields of traditional seeds and recycled hybrid seed their continued use can lead to low maize yields consequently denying farm households much needed income to improve their living standards or escape poverty.

[125] Generally observations from the study show that 42.1 %, 52.6 % and 5.3 % of those reporting use of fertilizers were applying farmyard manure, chemical fertilizers and using both respectively.

many rural areas of Tanzania which make it impossible or very expensive to access agricultural inputs, some of the quotations suggest that the respondents' crop husbandry may be limited and more education is required if the situation is to improve. While some respondents said they were not using fertilizers as their lands were quite fertile, nonetheless some were ready to use it if it were given for free (as aid), as shown by the following quotation: "[T]he land is still very full of natural fertility and there is no access to industrial fertilizers here; however, if I am given fertilizers as aid I will apply it to my farms", (An old male farmer in Nkansi).

Box 6.2: Reasons for farm households not using modern technologies

The reasons for the surveyed households not using chemical fertilizers could be generally grouped into three major categories as shown below;

Traditions, experience and local perception

"Using fertilizers seems like one is connecting him/herself with colonialism." (An old male farmer in Mpanda)

"Many locals say if you apply chemical fertilizers to the farm the farm gets damaged i.e. loses its natural fertility" (A middle aged male migrant farmer (from Kigoma) in Nkansi)

"Our farming is dependent on God's grace" (An old male farmer in Nkansi)

Economic hardships, unavailability and lack of motivation

"Fertilizers are not available locally, and no one is motivated to go elsewhere to get them". (A young female farmer in Mpanda district)

"I do not have money to purchase fertilizers" (A middle age male farmer in Mpanda district)

"Industrial fertilizers are very expensive, and I do not have the means to transport farmyard manure to my farm" (An old farmer in Nkansi)

Lack of extension services and/or Ignorance

"We do not apply fertilizers to our maize due to lack of extension officers to advise us and also due to our soil having sufficient fertility." (A middle aged male farmer in Mpanda)

"My farm is very rich in natural fertility, so there is no need for chemical fertilizers" (A young male farmer in Nkansi district)

Table 6.3: Rukwa households' use of modern technologies in maize production in 2005 by numbers and percentage

Characteristic		Rukwa Region (n = 191)	District		
			Sumbawanga (n = 66)	Mpanda (n = 66)	Nkansi (n = 59)
Tillage method used	Hand hoe	109 (57.1)	35 (53.0)	61 (92.4)	13 (22.0)
	Ox-plough	82 (42.9)	31 (47.0)	5 (7.6)	46 (78.0)
Use of fertilizers in maize production	Yes	57 (29.8)	9 (13.6)	23 (34.8)	25 (42.4)
	No	134 (70.2)	57 (86.4)	43 (65.2)	34 (57.6)
Maize seeds used	Traditional/Local seeds	134 (70.2)	50 (75.8)	46 (69.7)	38 (64.4)
	Hybrid seeds bought from input shops every year	19 (9.9)	3 (4.5)	10 (15.2)	6 (10.2)
	Hybrid seeds recycled from previous season	38 (19.9)	13 (19.7)	10 (15.2)	15 (25.4)
Household's use of extension services	Yes	73 (38.2)	19 (28.8)	35 (53.03)	19 (32.2)
	No	118(61.8)	47 (71.2)	31(46.97)	40 (67.8)

Source: Own survey 2006, *NB*: Numbers in brackets indicate percentage

Table 6.3 also shows that just over a third (38.2 %) of the households reporting production of maize in 2005 sought agricultural extension services from qualified staff. However, at the district level access to extension services by households was 28.8%, 53%and 32.2% for Sumbawanga, Mpanda and Nkansi respectively. Mpanda's relatively higher access was due to the fact that farmers growing tobacco had automatic access to tobacco extension staff employed by the tobacco companies, who could also advise on maize production if requested. The low access to extension services observed could in part be due to lack of adequate numbers of extension staff or the distance between the households concerned and the location of the extension officer's office and/or residence. According to NBS *et al.* (2006), Rukwa and Lindi rank last in terms of access to crop extension services, with only 17 percent of households having access; the highest access reported was 64 % (Dar es Salaam and Iringa). According to the study's findings, in some areas extension staff served more than one village; this was quite challenging to manage due to the geographic orientation of some areas in Rukwa, with the western rift valley passing through the region. Other factors are the underdevelopment of infrastructure and the lack of easy means of transport like motor cycles; though some officers have bicycles the terrain makes them an inefficient mode of transport.

Despite the fact that access to extension services was a problem to some of the households others were less keen to access the services, as shown in Box 6.3. The use or non-use of agricultural extension services among the surveyed households varied between the age groups. A close examination of respondents' comments shows that many elderly and middle aged respondents believed they had the necessary expertise and experience to produce their maize, particularly based on their years of farming or the experience of others in their villages as shown in the quotations above. On the other hand many younger respondents thought ignorance was a major factor in not seeking extension advice. This observation is supported by Dos et al., (2003) who argue that younger farmers are more open to new technologies compared to older ones, whose accumulated experience acts as an obstacle to adoption of new technologies compared to the younger who have less experience. Given the African or Tanzanian setting in particular where some of the extension staff are young and at times alien to their places of work, the older farmers may ignore them on the grounds, 'what can a young person tell me?', forgetting that although the extension officer is young he/she has had numerous years of training in crop husbandry. Younger farmers find it easy to interact and learn from young or slightly older extension staff. In general many young people are ready to venture into new territories compared to the elderly. Apart from these two fairly clear distinctions, study observations show that other factors, including lack of money for the adoption of technologies advised and unavailability of extension staff, affected all age categories in similar ways. However, some of the elderly and middle aged respondents, due to their traditions and/or experiences, lacked motivation for seeking extension services for their maize production due to the crop being perceived as a food crop, or for other reasons beyond the scope of this study.

Box 6.3: Reasons for not seeking agricultural advice from extension staff

Below are some of the quotations from the respondents with regards to not seeking extension advice in their maize production; The reasons given have been categorized into five broad groups of traditions, ignorance, lack of economic capability, lack of motivation and the lack of agricultural extension staff.

Reliance on own experience/ traditions

"I tried once in 1994 to seek extension services, but I did not see the benefits of the advice offered". (An old male farmer in Mpanda)

"I do not seek extension services because that is the culture of the other villagers I found in this village". (A middle aged migrant male farmer from Mbeya (Chunya) in Sumbawanga)

"I do not see any reason to why I should go to an extension officer; I have never tried to visit one". (An old male farmer in Nkansi)

"I rely on my own expertise; it's my hunger that motivates my farming". (A middle aged female farmer in Nkansi)

Ignorance

"It's just my negligence". (A young male farmer in Sumbawanga)

"I believe extension staff cannot help me". (A young female farmer in Mpanda)

"I think it's because of ignorance and because of not knowing the importance of extension workers". (A young male farmer in Nkansi)

"It's just sheer ignorance". (A middle aged male farmer in Mpanda)

Lack of economic capability to execute advice

"I normally seek extension advice for my livestock; it's difficult to seek agricultural advice as we do not have the capacity to use that advice. In fact I am surprised when I hear the government say there are no extension staffs: extension officers are available, but the only problem is farmers are poor. If you can please write to them and tell them that farmers have not been empowered". (A middle aged male farmer in Sumbawanga)

"I am afraid of seeking extension services because modern farming is expensive". (A middle aged female farmer in Mpanda)

"I do not seek extension services because I am afraid of the costs involved with modern farming". (A middle aged male farmer in Nkansi)

Lack of motivation

"I do not see the importance of seeing an extension officer" An old male farmer in Sumbawanga

"We do not seek extension advice for maize because we believe it's a food crop". (A middle aged male farmer in Mpanda)

Unavailability of extension staff

"I do not seek extension services because we do not have any extension officers in our village". (A young male farmer in Sumbawanga)

"The extension staffs available are those dealing with tobacco only, so there aren't any for maize". (An old male farmer in Mpanda)

The low maize yield levels observed among households in Rukwa may be due to various factors, some of which could be those pointed out by the surveyed households (see Table 6.5); these included reduced soil fertility, use of traditional low-yielding maize seeds or recycled hybrid seeds, lack of access or non-use of agricultural extension services, and environmental calamities.

6.3.2 Problems faced by households producing maize in Rukwa region

This section presents problems faced by the surveyed households in their endeavour to produce maize. An understanding of households' maize production problems could be critical if policy makers and agricultural extension staff are to increase rural farmers' productivity as a way of fighting rural poverty. Many problems have been reported by various researchers that handicap maize production; these include

inability to use fertilizers[126], use of poor technologies[127] expensive inputs; lack of capital; pests and diseases[128] harsh weather conditions[129] and lack of/or inadequate access to land. This section uses the qualitative data obtained from FGDs and surveys to help in explaining some of the observations from the quantitative analysis later in section 6.3.3.

Although many problems were reported by respondents in this study only a handful were mentioned by more than a quarter of the respondents interviewed (Table 6.5). Inability to use fertilizers was the most frequently mentioned problem at the regional level and this problem was relatively more important in Sumbawanga district compared to the other two. This observation corresponds with what has been reported by other researchers, both for farmers in Tanzania and elsewhere (Kaliba et al., 1998; Skarnstein, 2005; Mafuru et al., 1999; Dos et al., (2003). The other major problem, the inability of households to control pests/crop diseases, either through non-unavailability of pesticides or no means to buy them, was reported by slightly over a third of the respondents, but was more significant in Sumbawanga and Nkansi districts compared to Mpanda (Table 6.11)[130]. Pests and diseases have also been reported to be an obstacle to maize production in Tanzania (Nkonya et al., 1998 and Bisanda et al., 1998). Inability to utilize improved seeds was another major problem at the regional level. At the district level it was more pronounced in Sumbawanga and Mpanda compared to Nkansi (Table 6.4). Inability to use improved seeds has been a major problem affecting smallholder production in Tanzania. Kaliba et al. (1998) have reported that in western Tanzania farmers recycle maize seeds for five years in a row, and some farmers recycled their seeds for up to 10 - 15 years. According to Dos et al. (2003) adoption of improved technologies for staple crop production tends to increase smallholders' agricultural productivity, which can then lead to economic growth and improved wellbeing for millions of poor households.

The last major households' problem observed was their continued dependency on the hand hoe; this was a problem for slightly above a quarter of the region's respondents. At the district level it was more of a problem in Sumbawanga and Mpanda compared to Nkansi (Table 6.4). This observation is not peculiar to Rukwa but affects most Tanzanian smallholder crop producers. Preparation of the land by using the hand hoe is the major tillage method for more than half of Tanzania's smallholder farmers; its continued use shows that the prediction by supporters of trade liberalization about increased use of improved technologies is not working in Rukwa. According to NBS et al. (2006), hand slashing accounts for 79.6% of land clearing while bush clearance, burning and tractor slashing account for 6.9, 4.5 and 0.6%

---

[126] Kaliba et al., 1998; Skarnstein, 2005; Mafuru et al., 1999 and Dos et al., 2003.
[127] Dos et al., 2003 and NBS et al., 2006.
[128] Nkonya et al., 1998; Bisanda et al., 1998 and NBS et al., 2006.
[129] USAID-Tanzania, 2005 and MAFC, 2007.
[130] According to NBS et al. (2006) use of pesticides (insecticides, herbicides and fungicides) by farmers in Tanzania is generally low. The 2002/2003 National Sample Census of Agriculture reported insecticides were only applied to 9% of planted areas in Tanzania, with 53% of these insecticides applied to cereal crops, fungicides applied to only 2% of planted area with 47% of them going to cereals. Herbicides were only applied to 2% of the planted area, with 75% being applied to cereals.

respectively. In the actual soil preparation cultivation by hand represents 56% of all the planted land, whereas ox-ploughing accounts for 32% and tractor ploughing accounts for only 4%. No soil preparation (normally in case of cassava) accounts for 8%.

Other problems pointed out by the respondents in the current study are shown in Table 6.4. Those mentioned by at least 10 percent of the respondents include weather problems (inadequate rain, winds, and floods); high weed intensity; vermin/theft/livestock invasion; and high cost of insecticides. However, the proportion of these problems varied between the districts. Problems related to weather were seen as more important in Nkansi district, followed by Mpanda district and less of a problem in Sumbawanga district. High weed intensity as a problem was more or less a common concern for all districts although it was relatively higher in Nkansi followed by Mpanda. The intensity of weeds seemed to bother many respondents, particularly those with larger farm holdings, and more so because during the weeding seasonal shortage of casual labourers caused more hardship and even losses due to reduced crop yield. According to Lyimo and Temu (1992), cited by Bisanda et al. (1998), timely planting and weeding could raise maize yields from 700 kg/ha to 1,200 kg/ha.

All the above mentioned problems may explain the low productivity observed in this study as they confirm the findings already reported on farmers' use of technologies in maize production and their access to extension services. It appears that the only way to raise farmers' productivity is through participatory programmes in which policy makers, extension staff and farmers come together to address the current situation. This stance is supported by Odame et al. (2003) who argue that inefficient extension services are a cause of low agricultural productivity and that it is only through the involvement of all stakeholders namely farmers, extension staff, researchers, policy makers, input suppliers and output buyers, that agricultural productivity can be raised, increasing the possibility of reducing Tanzania's rural poverty by half by the year 2015 as required by the MDGs.

In the next section (6.3.3) the thesis using some simple linear regression models tries to establish factors that had a significant influence on the surveyed households 2005 maize yields and output. It considers whether any of the issues reflected in farmers' own concerns about maize production are also captured as factors influencing maize yield and output in 2005.

Table 6.4: Problems faced by households producing maize in Rukwa

Parameter	Rukwa region n= 200	District		
		Sumbawanga n=72	Mpanda n=67	Nkansi n=61
Unavailability/high cost of fertilizers	73(36.5)	37(51.4)	21(31.3)	15(24.6)
Pests and diseases	69(34.5)	32(44.4)	11(16.4)	26(42.6)
Inability to use improved seeds	62(31.0)	22(30.6)	28(41.8)	12(19.7)
Use of poor tillage methods (hand hoe)	54(27.0)	21(29.2)	22(32.8)	11(18.0)
Weather problems (inadequate rain, winds, floods)	39(19.5)	7(9.7)	15(22.4)	17(27.9)
High weed intensity	36(18.0)	15(20.8)	7(10.4)	14(23.0)
Vermin/theft/livestock invasion	29(14.5)	6(8.3)	16(23.9)	7(11.5)
High cost of insecticides	27(13.5)	13(18.1)	6(9.0)	8(13.1)
Old age/lack of capacity to farm	5(2.5)	5(6.9)	0(0.0)	0(0.0)
Unreliable maize market	7(3.5)	4(5.6)	1(1.5)	2(3.3)
Scarcity/lack of extension services	19(9.5)	8(11.1)	8(11.9)	3(4.9)
Low soil fertility	17(8.5)	2(2.8)	9(13.4)	6(9.8)
Lack of labour/inability to employ casual labourers	9(4.5)	5(6.9)	3(4.5)	1(1.6)
Low productivity of farm	7(3.5)	3(4.2)	3(4.5)	1(1.6)
Lack of storage facilities	2(1.0)	1(1.4)	0(0.0)	1(1.6)
Low price of maize	10(5.0)	8(11.1)	0(0.0)	2(3.3)
Small size of farm/inability to expand	13(6.5)	7(9.7)	3(4.5)	3(4.9)
Problem in transporting harvest from farm	7(3.5)	3(4.2)	0(0.0)	4(6.6)
Lack of capital to invest in maize farming	11(5.5)	0(0.0)	5(7.5)	6(9.8)
Illness within family	4(2.0)	0(0.0)	1(1.5)	3(4.9)

Source: Own survey 2006, *NB*: Numbers in brackets indicate percentage

6.3.3 Factors influencing Rukwa households' maize production

In this section the thesis using simple regression analysis models (Table 6.5) examines in detail the surveyed households' 2005 maize yields and output and how farm characteristics, household characteristics and location influenced maize yields and output. The farm characteristics to be considered include a household's farm size and its fragmentation, tillage method, number of crops grown by household and use of improved technologies. Household characteristics to be considered are; age, gender and education of household's head, household size, and number of livelihoods adopted, household's sale of maize, and access to extension services. Two models are estimated, using ordinary least squares[131]. The first model aims to investigate the importance of farm, household and location characteristics on yields, the chosen measure of productivity in this chapter, while the second model uses total output as its dependent variable. A common set of independent variables is used. In executing the

[131] The models use OLS simply because the aim is to examine correlations and associations, rather than conduct a formal econometric analysis. It is possible that some of the independent variables are correlated with each other and that some are endogenous, for example high yields or high output levels may actually determine if a household sells maize.

analysis the study chose to use the natural logarithm of yield and outputs in the above models respectively. This was mainly prompted by the fact that the relationship between the above dependent variables is not linear; in addition there is a likelihood that natural limits could be in operation for both maize yield and output.

First a set of farm characteristics and farming method variables are specified. These include:

- Total farm size (in ha), which is intended to shed light on the small farm efficiency hypothesis, a dummy variable indicating if the farm land is in a single plot, which may reveal whether economies of scale are available from having consolidated plots
- Three further variables, the proportions of land dedicated to maize production and to cash crops, and whether the household sells maize, capture the extent to which farms rely on maize or have access to other forms of incomes. It might be expected that households with a large part of land dedicated to cash crops put less effort into their production of maize, and so have lower maize yields. Conversely farmers with a large part of land dedicated to maize may have higher output, but it is not clear if their yields will be higher or lower as this may depend on other constraints. This may depend on whether they sell their maize, or use it for home production (or animal fodder)
- The number of crops and the number of livelihood strategies adopted by the household are also included as this may also indicate whether farmers put less effort into maize production.
- A set of variables that capture input use are also included: use of fertilizer, type of maize seed, use of extension staff, and use of oxen for tilling land, aiming to capture the benefits of improved farming practices that are associated with higher yields elsewhere.

A second set of variables captures key household characteristics of age, gender and education of the household head and household size. There is evidence elsewhere that education and experience may lead to higher yields, although it is not clear if these are important in the cultivation of a staple crop grown by the vast majority of the population. Gender may be important if for example, FHH are constrained to production for home consumption, or have difficulty in acquiring hired labour. A full gender analysis is not the aim of this research, although it is felt that this could be an important avenue for further research. Household size aims to capture the notion that large sized rural households would be able to easily supply the labour required for their crop production due to abundance of own labour.

A final set of variables are the dummies for the districts, which capture other characteristics that are not captured by the above, for example variations in soil quality between the districts, or proximity to markets. Results of the simple linear regressions are presented in Table 6.5 below.

Table 6.5: Simple linear regression of the natural logarithms of the surveyed households' 2005 maize yields (kg/ha) and output (kg) in 2005

Farm characteristics and farming methods	Natural logarithm of households' maize yield (kg/ha) in 2005	Natural logarithm of households' maize output (kg) in 2005
Households farm size (ha)	.006	**.355*** **
	(.040)	**(.042)**
Is crop farm a single plot of land (1=yes; 0=no)	-.121	-.095
	(.125)	(.131)
% of a household's farm land allocated to maize production	-.006	**.010** **
	(.004)	**(.004)**
% of a household's farm land allocated to cash crops	-.001	.000
	(.004)	(.004)
Household's sale of maize (1=yes; 0 = no)	**.376** **	**.399** **
	(.164)	**(.171)**
Number of crops grown by household in 2005	-.041	.007
	(.078)	(.081)
Number of livelihood strategies adopted by household	**-.148** **	**-.137** **
	(.060)	**(.062)**
Household's use of fertilizer in maize production (1=yes; 0=no)	.202	**.256***
	(.133)	**(.139)**
Household's use of improved maize seeds (1=yes; 0: no)	.010	-.081
	(.130)	(.136)
Household use of extension services (1=yes; 0 = no)	-.156	-.208
	(.130)	(.136)
Household's tillage method (1=oxen; 0= hand hoe)	**.423** **	**.499** **
	(.156)	**(.163)**
Household head's age	**-.010** **	-.008
	(.005)	(.005)
Sex of household head (1=male; 0=female)	.095	.129
	(.176)	(.184)
Actual school years of household head	**.046***	**.062** **
	(.026)	**(.027)**
Household size	.003	.024
	(.023	(.024)
Sumbawanga district (1= Sumbawanga; 0= otherwise)	-.116	-.186
	(.178)	(.186)
Nkansi district (1:Nkansi; 0= Otherwise)	-.141	-.168
	(.186)	(.194)
	Constant: 7.435* **	**Constant: 5.223*** **
	(.562)	**(.587**
	N = 191;	N = 191;
	R^2 .243 and	R^2 .557 and
	F Stat 2.814* **	**F Stat 11.016*** **

NB: Standard errors in brackets and ***Significant at 1% (0.001) level, **Significant at 5% (0.05) level and * Significant at 10 % (0.1) level

The first point to note is that the fit of the yield model is quite low especially compared to the output model. This suggests that there are other factors determining variations in yields that are not included in this model. One important omission is soil quality but unfortunately that variable was not possible to collect in this survey. Nevertheless, the F stats show that the models are useful for shedding light on maize yields and output levels.

Regarding farm characteristics and farming methods, there is lots of consistency and many appear to be significantly associated with outputs, but a few are not. For example, farm size, the proportion of farm land allocated to maize production and use of fertilizer, and these are statistically significant[132]. On the other hand the age of a household's head is only significantly associated with yield but not output. There does not seem to be any evidence of the inverse farm size-productivity relationship: smaller farms have marginally higher yields but the result is not statistically significant. The lower yields due to an increase in amount of land allocated may be due to factors such as households failing to do their weeding in time[133]. However, the results generally show that households with more land and those allocating a higher proportion of their land to maize production despite the lower yields observed did manage to get statistically higher maize outputs in 2005 compared to those with less land and those allocating a smaller proportion of the land to maize production. Number of crops grown and number of livelihood strategies have the expected outcome and are associated with lower maize yields and maize outputs, although the results show that only the latter influence were statistically significant. One very strong result is that households that sell maize have much higher yields and output than those that do not, suggesting that commercialisation of staples may be associated with higher productivity. This observation is further supported by Davis et al. (2007) who argue that market access is very important if households are to get greater returns from their crop and livestock production activities. In a similar way, households that devote more land to cash crops also have lower maize yields, supporting the hypothesis that effort on food crops may be lower.

Surprisingly, despite literature[134] showing that access to extension services may boost maize and other crops yields, Table 6.5 shows a lack of significant influence of access to extension services on either higher maize yields or output in 2005. However, according to Table 6.3 only about a third of the surveyed households accessed extension services, so this may explain the lack of significance. In addition access to agricultural extension services without households being able to access fertilizers and other inputs may have no effect, in fact some of the households not seeking extension services said a lack of means to execute the advice was their main reason for not doing so (see Box 6.3).

---

[132] Due to the study's data limitations and hence a lack of information on soil quality at the farm level, I am unable at this point make a firm conclusion on the influence of fertilizers on households' maize yields in 2005. According to URT ET AL. (2004) most parts of Rukwa region possess leached tropical ferralitic soils characterized by low inherent fertility, moderate acidity and low availability of plant nutrients coupled with low water retention capacity, indicating the need for use of chemical fertilizers. The low use of chemical fertilizers is not peculiar to Rukwa; according to NBS *et al.*, (2006) only 12% of crop growing households in Tanzania had access to chemical fertilizers in the 2002/03 cropping season, and in Rukwa only 6 % had access. Access to farmyard manure in the 2002/03 cropping season was 26% and 12 % for Tanzania and Rukwa respectively.

[133] As pointed out in Chapter Four Bisanda et al., (1998) argue that late weeding can lead to seriously low maize yields. According to the individual interviews and the FGDs many parts of Rukwa, especially those where maize is grown require at least weeding twice, therefore on a large maize farm some household's could be unable to weed in time, affecting their yields.

[134] Kaliba et al, 2000; Gemanda et al. 2001; Owen et al, 2003; SAA, 2007 and WB, 2007:a)

Regarding household characteristics, there are no statistically significant effects of age, gender or household size on yields or output. Education however, does have a statistically significant impact on maize yields. This may reflect greater awareness of good farming practices, e.g. how and when to apply fertilizers or pesticides, or store seeds from one harvest to the next. Certainly there seems to be some support for the idea that educating farmers who grow food crops would have positive impacts.

Finally, the district dummies are not statistically significant. This suggests that unobserved differences between the districts (such as soil quality) are not significant, although of course the latter may be already picked up in the variables that capture use of fertiliser etc. (because there may be a relationship – positive or negative - between soil quality and whether a farmer uses fertiliser.

Generally, observations from the regression analysis are consistent with the issues raised by the surveyed farmers. For example, households had raised in the interviews the issue of lack of access to modern inputs (fertilizers and improved seeds) due to either unavailability or price restrictions as being a as being a constraint to their maize production. This finding is supported generally by the regression results on maize output – lots of the corresponding variables have statistically significant coefficients, suggesting that farmers who did have access to these inputs had higher outputs. However, the yield regression is less conclusive: using modern inputs and methods do raise yields but not to a statistically significant extent. It is possible that the lack of access to extension services, and the re-use of seeds rather than purchasing new seeds each season, reduces the effect that inputs have on yields.

The regression analysis further suggests that households that sell maize, rather than keep the whole harvest for home consumption, have higher yields than those that do not. This does not necessarily imply causation but is suggestive of the importance of boosting productivity in order for farmers to generate surplus output. Yields also tend to be higher among farmers that are less diversified; the more livelihood strategies are adopted, the lower the maize yield. Again, this does not necessarily imply causality but is suggestive that while diversification may be an appropriate response to risk and vulnerability, it will not necessarily enable farmers to escape from poverty traps. Education is also a very important factor associated with higher yields. Some of these results confirm expectations, others are more surprising. For example the lack of a significant positive influence of access to extension services on increased yields and output, access to extension services is normally expected to help raise productivity levels. This was the case with the Sg 2000 project implemented in the northern parts of Tanzania, where access to reliable extension services and the promotion of input use, for example chemical fertilizers, led to a rise in smallholders' maize yields to between 4.5 and 5.1 tonnes/ha, compared to the national average yield of around 1.3 tonnes/ha (SAA, 2007).

The thesis in the next sub-section examines maize marketing by the households to determine the type of buyers' available, distance to the markets and whether there is a general variation between the three districts with regard to maize marketing.

6.4 Maize marketing

6.4.1 Introduction

Farmers mentioned that access to markets is important. The 1986 agricultural reforms by the government made significant changes to the way maize is marketed in Tanzania, abolishing the 500kg limit of the amount of grain one could privately trade (Coulter and Golob, 1992 and Amani et al. 1989 as cited by URT *et al.*, 2000). Prior to the reforms the major player in the purchase of cereals was the National Milling Cooperation (NMC), a parastatal. NMC was responsible from 1973 for the purchasing, processing, storage and selling of staple grains such as maize, rice, wheat, and drought resistant crops namely sorghum, bulrush millet, finger millet and cassava. NMC was also granted a monopoly on imports of agricultural products (Nindi, 1990 and Meertens, 2000). Tapio-Biström (2001) citing Bryceson (1993) points out that crop purchases by NMC from Rukwa, Ruvuma and Mbeya in the Southern Highlands reached 52 % of the organizations total purchases in 1982/83, up from a low 12% in 1978/79. As pointed out in section 6.3.1 access to markets is very important to farm households' success in agricultural production. Due to the importance of marketing to crop productivity (Nkonya et al., 2005 and WB, 2007) the chapter in this section aims to examine how maize is marketed in Rukwa, using evidence from the surveyed households' answers to questions on how they market their maize, and also on their opinions on marketing constraints and on the reforms themselves.

6.4.2 Maize marketing characteristics by households

Generally, observations from the study (Table 6.6) show that just over half of the 191 households that produced maize in 2005 sold some. Some variations existed between the districts with Nkansi reporting the highest proportion of households selling maize and Mpanda the lowest (Appendix 6.3). Reporting the actual proportion of maize sold in 2005 relative to amount produced; Sumbawanga reported a higher proportion than Nkansi. Mpanda once again reported the lowest proportion; on average its households selling maize in 2005 sold about half of what they had produced. The variations between the districts might be explained, at least in part, in that households in Mpanda on average grew less maize than in other districts, and therefore had less to sell, because of the prevalence of tobacco as a cash crop (Table 6.2). In other districts households rely much more on maize as both a food and cash crop (Table 5.4). Nevertheless, the observation that households sold some of their maize conforms to reports on Rukwa by other researchers' and on other parts of Tanzania[135].

[135] Bisanda, et al., 1998; Ashimogo, 1995 and Maghimbi, 2007.

Table 6.6: Maize marketing by households that actually sold maize in 2005

Characteristic		Rukwa Region n = 103	District		
			Sumbawanga n = 39	Mpanda n = 20	Nkansi n = 44
Amount and price of maize sold	Amount (kg) of maize sold by households in 2005	1,322.23	1,410.26	982.50	1,398.64
	Average proportion of maize sold as a % of production of produced maize	50.00	58.43	39.84	47.13

Source: Own survey 2006, *NB*: Numbers in brackets indicate percentage

Generally, observations from the study (Table 6.7) show that small crop traders were the major buyers of households' maize in 2005. According to the individual interviews and the FGDs some of the small traders are at times locally based, some of them buy maize and other crops and later resell to big buyers in urban areas or to those coming to the villages in search of maize. According to the FGDs at times some traders from within the villages do retain some of the maize they buy from fellow villagers to later sell to needy farm households within their localities; this is normally the situation just one or two months before the next harvesting period.

Generally, more than three quarters of those selling in 2005 sold to buyers within a radius of less than 1km, a situation which does not differ very much between the districts (Table 6.7). These observations suggest that maize is traded more locally, but it does not mean that the maize is consumed locally as most of the small crop traders resell the maize to big crop traders from within or outside their districts. The relatively high proportion of households in Mpanda reporting that they sell maize beyond a distance of 1 km was mainly due in some instances to remoteness of the villages and at times due to some households searching for better maize prices further afield in other markets or in the district capital town, for those not very far from such centres.

Table 6.7: Main buyers of surveyed households' maize in 2005

Characteristic		Rukwa Region n = 103	District		
			Sumbawanga n = 39	Mpanda n = 20	Nkansi n = 44
Main buyer	Strategic Grain Reserve (SGR)[136]	1 (1.00)	0 (0.00)	0 (0.00)	1 (2.27)
	Small crop traders	60 (58.25)	22 (56.41)	13 (65.00)	25 (56.82)
	Large crop traders in district	11 (10.68)	5 (12.82)	3 (15.00)	3 (6.82)
	Large crop traders from outside district	8 (3.88)	4 (10.26)	0 (0.00)	1 (2.27)
	Local market	27 (26.21)	8 (20.51)	4 (20.00)	14 (31.82)
Distance to market/buyer	Less than 1 km	83(80.60)	29(74.40)	15(75.00)	39(88.60)
	More than 1 km	20 (19.40)	10 (25.60)	5 (25.00)	5 (11.40)

Source: Own survey 2006, *NB*: Numbers in brackets indicate percentage

The data in Table 6.8 shows a lot of price variation, mainly brought about by small crop traders who seem to pay high on average but vary widely in the prices they offer. For this reason the study bases its discussion on median prices, because there is a possibility that the high means could be a result of a very small number of observations that may unreliable. As shown in the Table households in Mpanda district received a relatively higher price for their maize compared to the other two districts; the former also had a higher median price compared to the latter (Table 6.8). Although the study may not be able to authoritatively explain the actual cause for Mpanda's higher price due to data limitations, the assumption at this point is that Mpanda according to some of those surveyed does enjoy a good maize market in Kigoma region, which borders the district to the North. According to the respondents Kigoma is not good maize producing which creates a ready market for maize from Mpanda. Another assumption could be that since some of the households selling maize in Mpanda also sold tobacco, they may have been able to wait for better prices, late in the season, than the low prices normally offered at the beginning of the season when there is plenty of maize to sell. Unfortunately, none of this can be tested. However, the median maize prices offered to households indicate that the variation in price received by households is much smaller. The huge price range of between 5,000/= - 42, 000/= (Tsh) could be a result of the year 2005 being not a very good year in many parts of Tanzania. The country had pockets of food insecure areas which drove the price of maize to higher levels than normal. According to FEWSNET (2005), a rapid food insecurity vulnerability assessment conducted in August 2005 by the Food Security Information Team (FSIT) revealed that 594,503 people in 34 districts were facing acute food shortages. This led the FSIT to

[136]The Strategic Grain Reserve (SGR) was a unit under the National Food Department established in 1991 under then Ministry of Agriculture (URT, 1991). The SGR was responsible for issuing of grain import permits, and issuing of grain export permits and traditional stocking of traditional food crops such as maize, sorghum, beans and rice. However, the SGR has now been transformed into the National Food Reserve Agency (NFRA). The main aim of the new agency is to maintain a national optimal level of food reserve to address local food shortages and respond to immediate emergency food requirements. In principle the agency is supposed to procure and store emergency food stock to the tune of 150,000mt that should suffice in addressing a food disaster for three (3) months period regarded enough to order and secure food imports. The NFRA is currently under the Ministry of Agriculture Food Security and Cooperatives. (MAFC) (http://www.kilimo.go.tz/attached%20web%20pages/NFRA/functions.htm [25/02/10]).

recommend a release of 20,932 metric tonnes of maize from SGR for sale to the vulnerable households at a subsidized price of 100 Tsh per Kg.

Alternatively the study assumes that since most of those selling maize in Mpanda sold to crop traders (Table 6.7) who may have been competing amongst themselves by offering higher prices so as to attract sellers. As earlier mentioned some of the crop traders buy maize and resell to other big traders from within their districts or even further away. Unfortunately, none of this can be tested, and despite trying to disaggregate the maize prices by type of buyer (Appendix 6.4) still not much can be explained despite the relative variations of prices offered. Those selling to small crop traders within their localities seemingly received the highest price and this is perhaps why more than fifty percent of those selling maize in 2005 sold to this category of buyers.

Further examination of maize prices received by households in 2005 show only some minor price variations with regard to price offered to maize producers, depending on their distance to the market and the size of their production (Table 6.8). Generally, the Table shows that households selling close to home received a relatively lower price compared to those selling further away[137]. On the other hand Table 6.8 surprisingly shows that larger producers got lower prices for their maize compared to small producers, possibly because they sold to larger crop buyers who seem to pay less than small crop buyers. As Appendix 6.6 shows, more than half of the larger producers sold in markets that were more than 1 km from their home. Having travelled all the distance to market at times up to 10 Km, the farmer would not be ready to return home with all his maize because of some small price differences between the buyer and seller, as doing so could be very inconvenient to him/her.

Table 6. 8: Surveyed households maize price summary statistics based on location and buyer

Characteristic		Average price (Tsh) of maize in 2005[a]	Price range	Median price
Location	Rukwa Region (n = 103)	13,643.00	5,000.00 – 42,000.00	12,000.00
	Sumbawanga (n = 39)	12,615.40	5,000.00 – 30,000.00	12,000.00
	Mpanda (n = 20)	17,800.00	9,000.00 – 42,000.00	15,000.00
	Nkansi (n = 44)	12, 663.60	6,000.00 – 26,000.00	12,000.00
Buyer	Household sales maize to small crop traders (n=60)	14,175.00	5,000 – 42,000	12,000.00
	Household sales maize in local market (n = 27)	12,785.19	6,000 – 20,000	12,000.00
	Household sales maize to large crop traders within district (n = 11)	14,000.00	9,000 -21,000	12,000.00
	Household sales maize to large crop traders outside district (n =4)	11,375.00	8,000 – 15,500	11,000.00
	Strategic Grain Reserve SGR (n=1)	10,000.00	n.a	n.a
Distance to maize market	Less than 1 Km (n = 83)	13,189.16	5,000.00 – 42,000.00	12,000.00
	More than 1 Km (n = 20)	15,525.00	8,000 – 30,500	15,000.00
Size of maize output	Small(i.e. ≤ 1800 kg) (n = 55)	14,654.55	5,000.00 – 42,000.00	12,000.00
	Large (i.e. ≥1800 kg) (n = 48)	12,483.33	6,500.00 – 24,000.00	12,000.00

Source: Own survey 2006, *NB*: Numbers in brackets indicate percentage

[137] The study is unable to further determine any additional gains from this as information on transport cost if any is unavailable.

The final marketing issue to be covered by the section is the sources of maize market information. According to Table 6.9 most of the households in the study got this information from the buyers who bought directly from the farmers at their homes, or in the local market. However, despite the possibility that farmers may have little independent information about what price maize is going for, observations from the study (Appendix 6.4) do suggest that the amount of maize sold by households may not have been a major determinant of the price being offered. Appendix 6.4 shows that some of those selling very little maize may have got just as good a price as those selling large amounts. The study's assumption at this point due to data limitation would be that competition among the buyers may have been the reason for a lack of significant variation between the buyers or else on basis of amount sold.

Table 6.9: Source of maize market information by households selling maize in 2005

Characteristic		Rukwa Region n = 90	District		
			Sumbawanga n = 34	Mpanda n = 18	Nkansi n = 38
Source of market information	Friends	13 (14.4)	4 (11.8)	2 (11.1)	7 (18.4)
	Buyers	62 (68.9)	22 (64.7)	13 (72.2)	27 (71.1)
	Media	7 (7.8)	2 (5.9)	2 (11.1)	3 (7.9)
	Both buyers and media	4 (4.4)	3 (8.8)	1 (5.6)	1 (2.6)
	Both friends and buyers	4 (4.4)	3 (8.8)	0 (0.0)	0 (0.0)

Source: Own survey 2006, *NB*: Numbers in brackets indicate percentage and [a] Calculations have been made on basis of all households growing maize in 2005.

From the above it can be concluded that most of the households sold their maize within their villages and most relied for their market information from the buyers. It is also concluded that since the liberalization of the maize market in 1986 farm households have a variety of buyers to whom they can sell their maize and that maize price has fluctuated relative to the past, when the government used to set a price at the beginning of each cropping season (Geir, 1995), cited by Meertens (2000).

6.4.2 Respondents' opinions on maize marketing in their area

Having examined the quantitative data on maize marketing, the chapter now turns to examining farmers opinions of maize marketing. Gauging rural farmers' opinions on maize marketing in their locations enables an evaluation to some extent of the efficiency of the marketing structure's pricing and access. Farmers' positive or negative opinions on the maize market can eventually affect their productivity with regard to output per hectare for better or worse, with positive opinions implying that farmers are contented and might explore the possibilities of increasing production, which could then lead to increased income. However, negative opinions could lead to reduced production, denting farm households' chances for improving their incomes and eventually their well-being. Results from the study (Table 6.10)[138], show that

[138] The table presents information on maize marketing from all the 200 respondents involved in the study, not only

less than a fifth of the respondents were happy with the current market situation while slightly above two thirds were unhappy. Those happy with the current market situation stated that the market was offering them good prices for their maize and more buyers were now available. Reasons given by those not satisfied with the current market situation included; a lack of reliable buyers or reliable market; low maize prices offered by buyers; fluctuation of maize prices; and the government's failure to monitor maize markets, causing the low prices offered to farmers (Table 6.10). Some statements from the respondents in relation to their opinion on the current market situation are presented in Box 6.5.

Box 6.5. Households opinions on the current maize market situation

Below are some quotations from the respondents in relation to their opinion on the maize market;

Respondents happy with the current situation

"The market is good and we are getting a high price for our maize" **A middle-aged male farmer-Kabungu, Mpanda district**

"The market is good, however it normally depends on there being many buyers" **A young female farmer-Kananazi village, Nkansi district**

"The market is good and the price is adequate" **A young male farmer-Chala village, Nkansi district**

Respondents not happy with the current situation

"The current market situation is not very promising; most of the small crop buyers offer us very low prices. It would be nice if the government could intervene and buy the maize" **A young male farmer-Sandulula village, Sumbawanga district**

"The government should set the price for maize depending on production costs" **A middle-aged male farmer-Sandulula village, Sumbawanga district**

"The market situation is not good as buyers offer the price they want and producers are compelled to sell mainly due to hardships and lack of alternative buyers" **A young male farmer-Mtapenda village, Mpanda district**

"The maize market situation is not satisfying at all, the prices are high at one time and low at another" **A middle-aged male farmer-Igagala village, Mpanda district**

"The market situation is not good, one cannot sell a lot of maize at once, for example you cannot sell a 100 bags of maize at once you have to sell in smaller quantities" **A middle-aged male farmer-Kapalamsenga village, Mpanda district**

"There is no reliability in the price of maize in our area, in fact those with cash are taking advantage of us, we're being exploited" **A middle-aged male farmer- Londokazi village, Nkansi district**

"The price of maize is very unpredictable, it is up at one time and down at another time, we need stable prices" **A young male farmer-Londokazi village, Nkansi district**

According to Table 6.10 the dislike of the market situation was more pronounced in Nkansi district compared to the other two; however the same district had a higher percentage of respondents satisfied with maize prices. Availability of buyers caused by reforms was more welcome in Mpanda district than in the other two districts, perhaps because the district is more isolated from the regional headquarters through the lack of good roads, which would have eased trade with other regions where maize demand is high. Dislike of the current market situation due to low or fluctuating maize prices was higher in Sumbawanga than the other two districts (Table 6.10). The study's observations (Appendices 6.5 and 6.7)

---

for the 191 who cultivated maize in 2005 (covered in detail in section 6.3). This is mainly due to the fact that eight out of the nine households that did not cultivating maize in 2005 report that their households do sell maize. It is quite common for people living in a locality to have some information on important things that could impact on their lives.

do not clearly explain why there was more dissatisfaction with the maize market in Sumbawanga compared to Nkansi. Although Appendix 6.5 shows that Nkansi had a relatively higher proportion of larger maize producers (i.e. those producing 1800 kg or more) in 2005[139] and Appendix 6.7 shows a significantly higher proportion of the larger producers being unhappy with the maize market situation, the Appendix also shows that the average price received by the larger producers was lower than that received by those producing less. On this basis it would be natural for households in Nkansi to be unhappy relative to those in Sumbawanga. The higher dissatisfaction by households in Sumbawanga may perhaps be due to households in the district selling a relatively higher proportion of the maize they produced in 2005 compared to households in the other district (Table 6.7).

A brief conclusion based on the observations above is that whereas a few respondents were happy with the current market situation most were unhappy. The lack of satisfaction with the market was mainly due to a lack of reliable buyers, and low prices offered by buyers. The respondents' views are echoed by observations from the FGDs, for example the under 35 female FGD participants from Kibaoni (Mpanda) pointed out that maize marketing in their area was not very satisfactory as their maize was mainly bought by local crop traders at lower prices to later re-sell at higher prices to other traders from outside the locality, especially traders from Mpanda town (FGD held on 13/10/2006 at Kibaoni, Mpanda).

Table 6.10: Respondents' opinion on maize marketing in their area

Parameter	Rukwa region	District		
		Sumbawanga	Mpanda	Nkansi
Respondents' opinion on maize marketing in their area	**n = 200**	**n = 72**	**n = 67**	**n = 61**
Happy with current market	33(16.5)	15(20.8)	9(13.4)	9(14.8)
Not happy with current market	137(68.5)	45(62.5)	44(65.7)	48(78.7)
No opinion	30(15.0)	12(16.7)	14(20.9)	4(6.6)
Reasons for respondents' liking of the maize market	**n = 28**	**n = 12**	**n = 9**	**n = 7**
Good price offered for maize	16(57.1)	6(50.0)	4(44.4)	6(85.7)
Availability of buyers	11(39.3)	5(41.7)	5(55.6)	1(14.3)
Availability of buyers and good price offered for maize	1(3.6)	1(8.3)	0(0.0)	0(0.0)
Reasons for respondents' dislike of the maize market	**n = 135**	**n = 46**	**n = 41**	**n = 48**
Lack of reliable buyers/lack of reliable market	38(28.1)	9(19.6)	16(39)	13(27.1)
Low price offered by buyers/price fluctuation	64(47.4)	26(56.5)	15(36.6)	23(47.9)
Government's failure to get fully involved	33(24.4)	11(23.9)	10(24.4)	12(25.0)

Source: Own survey 2006, *NB*: Numbers in brackets indicate percentage

[139] This cut off point is based on the boundary of the fourth quartile of those producing maize in 2005.

6.4.3 Respondents' views on liberalization of the maize market

This final section examines answers to questions about the reforms. Gauging rural farmers' opinions on liberalization of agricultural markets following the 1986 reforms is very important as it shows the extent to which the reforms have been accepted. Generally, observations from the study (Table 6.11) indicate support for the government's liberalization of the maize market in 1986. At the district level the support is more or less similar despite the relative higher proportion of households in Mpanda being marginally more supportive. However, despite the general support for the liberalization of the maize market the surveyed households wanted the government to be more involved, particularly in monitoring the markets, so that maize producers could be offered a better price for their produce. At the district level a relatively higher proportion of households in Nkansi wanted the government to be associated closely with the maize market compared to the other two districts. The greater concern by households in Nkansi might be due to the fact that on average households in the district had much larger maize output and larger producers as compared to the other two (Table 6.2 and Appendix 6.5), so perhaps respondents thought some form of price monitoring by the government could enable them earn more income in the current situation. Some of the surveyed households indicated that liberalization of the maize market had been good but that the only problem was the fluctuation in price from time to time (see Box 6.5)

Table 6.11 further shows that generally more than half of the respondents were against the government allowing foreign traders to participate directly in buying maize from producers. At the district level the response was similar. The resistance by the respondents to foreign traders buying directly from producers was mainly based on fear that such a move could lead into food insecurity in their area, as shown by some of the respondents' statements (see Box 6.6). These opinions from the respondents echoed those given in the focus group discussions (FGDs). In the FGDs respondents argued that opening up of the maize market to foreigners might tempt farmers to sell most of their maize, exposing them to food insecurity, particularly towards the end of a new farming season when crops are in the farm but not ready for harvest. Most discussants admitted that many households sell their maize at the beginning of the harvesting season and later, when their supplies dry up, find themselves buying from the same people they sold to. Therefore, the FGDs members said it was best to sell the maize between themselves or to nearby districts or regions where it is easy to get supplies in case of need compared to maize bought from, for example Malawi, Zambia, or the Democratic Republic of Congo. The latter two border the study area and could be a better market for Rukwa's maize compared to Dar es Salaam, which is hundreds of miles away.

Box 6.6. Households response to participation of foreign traders in the maize market

Below are some quotations from the respondents against Tanzania's government allowing foreign traders to buy maize directly from the farmers?

"I can only support opening up of the maize market to foreigners in case we have a surplus". (A middle aged male farmer in Sumbawanga district)
"We will be left with hunger if the government allows foreign buyers to come and buy maize in our villages". (A middle aged male farmer in Mpanda district)
"We may run out of food if the government opens up the market to foreigners". (An old male farmer in Mpanda district)
"I do not agree with the idea of our government opening up the maize market to foreigners as this may lead to people dying of hunger". (A young male farmer in Nkansi district)
"Allowing foreigners to purchase maize in our villages will leave us food insecure". (An old male farmer in Nkansi district)

Table 6.11 also shows that a higher proportion of the surveyed households at the regional level were against the government setting maize prices than those in support. At the district level, more opposition was in Nkansi district than the other two districts. The district's higher opposition to price setting by the government may be due to it having a relatively higher percentage of larger maize producers and also its reporting of a relatively higher maize output in 2005 compared to the other two (Table 6.2 and Appendix 6.5). Due to this households in Nkansi may prefer to negotiate their maize prices as compared to the government setting them. Households in Nkansi wanted the government to be actively involved in the market in a monitoring role, to prevent unscrupulous traders from taking advantage of maize producers by offering very low prices that do not cover their production costs or allow them some margin to spend on other household needs.

Observations from the study suggest that most of the surveyed households were in general support of the government's liberalization of the maize market. According to the study the larger maize producers were relatively more supportive compared to the smaller ones. Their greater support may be based on the fact that they would prefer a more open market where they can negotiate better prices for their produce compared to a controlled environment. It can also be concluded from this section that households in Nkansi were more supportive of the government's involvement in the maize market in a monitoring role, based on their dissatisfaction with the current maize market. A substantial proportion of the respondents complained that maize prices were very unreliable and that at times farmers did not cover costs incurred in the production process. Lastly, a majority of the respondents were against opening up of maize markets for traders from beyond Tanzania's borders, most being worried that this could lead to food insecurity for most villagers. Some of the respondents and FGD participants argued that if maize is sold beyond the borders some villagers would be food insecure as some of them normally sell maize just after the harvest and do not keep enough stock to carry them to the next harvest. Therefore, they need to buy maize for their own consumption normally two to three months before the next harvest.

Table 6.11: Respondents' opinions on some aspects of the liberalized maize market

Parameter		Rukwa region n = 199	District		
			Sumbawanga n = 71	Mpanda n = 67	Nkansi n = 61
The government was right in liberalizing the maize market	Agree	133 (66.83)	45 (63.38)	48 (71.64)	40 (65.57)
	Disagree	51 (25.63)	19 (26.76)	13 (19.40)	19 (31.15)
	Undecided	15 (7.54)	7 (9.86)	6 (8.96)	2 (3.28)
The government should participate actively in maize marketing	Agree	163 (81.91)	55 (77.46)	53 (79.10)	55 (90.16)
	Disagree	21 (10.55)	7 (9.86)	9 (13.43)	5 (8.20)
	Undecided	15 (7.54)	9 (12.68)	5 (7.46)	1 (1.64)
The government should allow traders from outside Tanzania to buy maize from producers	Agree	72 (36.18)	23 (32.39)	26 (38.81)	23 (37.70)
	Disagree	110 (55.28)	38 (53.52)	38 (56.72)	34 (55.74)
	Undecided	17 (8.54)	10 (14.08)	3 (4.48)	4 (6.56)
The government should set the price of maize	Agree	86 (43.22)	28 (39.44)	34 (50.75)	24 (39.34)
	Disagree	97 (48.74)	32 (45.07)	31 (46.27)	34 (55.74)
	Undecided	16 (8.04)	11 (15.49)	2 (2.99)	3 (4.92)
The government should regulate maize marketing to ensure producers get a good price	Agree	167 (83.92)	59 (83.10)	53 (79.10)	55 (90.16)
	Disagree	20 (10.05)	5 (7.04)	10 (14.93)	5 (8.20)
	Undecided	12 (6.03)	7 (9.86)	4 (5.97)	1 (1.64)

Source: Own survey 2006, *NB*: Numbers in brackets indicate percentage

6.5 Conclusions

The chapter has examined production of six popular crops in Rukwa, three food crops; maize, rice and dry beans, and three cash crops; groundnuts, sunflower and tobacco. Although the major emphasis of the thesis was maize production it's a general expectation that lessons learned, for example in relation to production constraints and marketing characteristics could be applicable to other crops as well. Generally, the study has found that productivity of maize and the other crops was relatively lower than levels reported in other parts of the world. However, with concerted efforts by both extension staff and farm households there is a great possibility that a higher productivity similar to those levels recorded elsewhere in the developing world (Appendix 6.3) could be achieved, raising households' income.

In the effort to investigate crop production by the surveyed households in both discussions with farmers in the FGDs and in the quantitative work based on survey data maize was found to be one of the most important crops for farmers, yet there was a general consensus that farmers faced significant barriers to improving yields and output levels. Farmers reported for example that accessing important inputs such as new seeds, fertilizers and extension services was difficult, either because these inputs were expensive,

not available locally or not available together, or because they felt their soil was fertile enough already and they distrusted modern inputs (i.e. no advice on fertilisers). The lack of statistical significance in the yields regression results of impacts of fertilizer, extension services and seeds suggests that a combination of factors are at work: simply using them does not raise yields, as they need to be used in the right quantities and at the right time and in combination with other things.

The study found that better educated farmers had higher yields, which may support the above observation. Having more education means that farmers can more easily overcome constraints of poor agricultural extension services and access to market information. More educated individuals can also easily get information from printed media such as agricultural pamphlets, brochures and posters which could be locally available or obtained during agricultural shows ('*maonyesho ya wakulima*") such as those held all over Tanzania in the first week of August before climaxing on the 8th of August on '*Nane Nane*', a public holiday specifically set aside to celebrate farmers and their achievements. During the '*Nane Nane*' shows many agricultural stakeholders such as the Ministry of Agriculture, Crop Boards, agricultural input companies and NGO's working in agriculture and rural areas give away literature on crop and livestock production among others. During the shows visitors to the various pavilions are educated on various aspects of agriculture and questions are answered. With the current trend farmers' achievements being celebrated from, for example, the ward and division administrative levels, the possibilities for more educated farmers benefiting are much higher. Furthermore, more educated individuals are better placed for measuring risk and decision making through their ability to assemble most of the facts to enable sound decisions to be reached as to what crops and livelihood activities a household should undertake.

The study also found that to an extent, diversification across livelihood strategies lowered yields, suggesting that farmers are either unable to apply as much effort to maize productivity when they are occupied with other activities, or that they choose a lower productivity rate because they can earn income from other sources. Certainly maize yields were lower in Mpanda where tobacco is an important cash crop. This observation however could also mean that households diversifying into less remunerative activities may find themselves trapped in poverty, based on the fact that their low maize yields and presumably those of other crops may lead to the household's food insecurity. Alternatively the households may have to spend most if not all the income earned from the other livelihood strategies to meet their food needs and end by being trapped in poverty. The above assumptions are supported by research literature[140]. According to this literature, diversification into un-remunerative activities where entry and exit are reasonably frictionless could be a recipe for an asset poverty trap in which the poor have trouble breaking out of a diverse set of low-return activities. The relationship between diversification of livelihood

[140] Dercon, 1998; Carter and May, 1999; Barrett et al., 2000; Reardon et al., 2000; Carter and May, 2001; McPeak and Barrett, 2001) as cited by Barret et al., 2001.

strategies and well-being will be investigated further in Chapter Seven which examines the general wellbeing of the surveyed households.

The study has also found that about half of the households producing maize in 2005 sold part of it, accounting to about half of the amount they produced. Generally, based on the 2005 information some variations did exist within the districts with regard to amount sold and it was evident that households in Mpanda, which relied less on maize as a source of income, sold less than the other two districts. This observation shows the importance of commercialization of staples for if households are confident that they can buy their food supplies from the markets then they may decide to produce other commodities or engage in other livelihood activities and use income earned to purchase their food. In a similar way, the study also showed that households that devoted more land to cash crops had lower maize yields, supporting the hypothesis that effort on food crops may be lower. The study has further observed that most of those selling part of the maize they produced were nevertheless not very happy with the current market situation, especially those selling a higher proportion of their produce. Most of the respondents wanted the government to play an active monitoring role to ensure that producers get a fair price for their produce.

Finally, the chapter has shed light on maize marketing in Rukwa. It was observed that most of the surveyed households sold maize to small crop vendors within their localities Due to apparent competition amongst the small crop vendors in wanting to buy maize to resell fast to big crop vendors within or outside their district, maize prices varied widely. However, the median price showed a lack of much price variation between the districts, categories of buyers and market distance. The chapter also found out that despite a substantial majority of the surveyed households being in support of the government's liberalization of the maize market, many were not happy with the current market situation due to lack of reliable buyers, low prices offered by buyers and the lack of government involvement as a regulator.

Chapter Seven

Well-being among rural households in Rukwa

7.0 Introduction

Tanzania has for a long time experienced low levels of well-being. Despite a slight rise of 1.15% in her HDI from 0.436 (1990) to 0.530 (2007), based on the 2007 HDI the country ranks 151st out of 182 countries on which data is held. With an HPI-1 value of 30.0% the country ranks 93rd among 135 countries for which the index has been calculated[141] (UNDP, 2009). Policy changes since the 1980s would indicate the likelihood of some changes in well-being. This chapter aims to understand levels of well-being among rural households in Rukwa, the relationship between well-being and agricultural production, particularly the contribution of maize sales and other crops to household income and assets, and their ability to pay for key services such as health and education. Following the underperformance of Tanzania's agricultural sector and deteriorating living standards in the 1980s and 1990s, the government instituted various socio-economic reforms aimed at among other things improving well-being of rural and urban dwellers. Among the policies instituted was reform of the agricultural sectors that led to the liberalization of the maize market in 1986. Previous chapters have highlighted the continued importance of maize production in Rukwa. There has been an increase in land under its cultivation and an increase in output, which may lead us to the conclusion that income from maize had risen too. However, Chapter Six has shown that the expansion of land under maize production has not been matched with increases in yield, so incomes may not have risen accordingly.

The chapter pursues a number of hypotheses, one of which is to examine the role maize plays in well-being. Commercialization is one way of ensuring households' food security and general well-being (Spring, 2000 and Hazel et al., 2007). Literature shows that commercialization at the farm level could take place in various ways by growing of cash crops, change in the share of marketed output or change in the share of purchased inputs per unit of output (Satyasai and Viswanathan, 1997). The chapter aims to examine how commercialization of crop production by households, especially of maize, was associated with their well-being. Secondly, diversification of livelihood strategies by households has been shown in previous chapters to be common amongst rural households; the chapter aims to examine how diversification of crop and LS is associated with general well-being.

Finally, the chapter explores a number of other features associated with well-being such as human capital. Generally, household heads' attributes, for example gender, education level and ownership of assets such as land, could influence a household's choice of LS and eventually their well-being. According to research

[141] Using other measures of well-being such as the probability of not surviving to age 40 (%), adult illiteracy rate (% for ages 15 and above), and people not using an improved water source (%) puts the country in the lower ranks of 129, 111, and 137 respectively (UNDP, 2009).

by Ellis and Allison (2004) there is a possibility that well-being may differ between MHHs and FHHs, as differential access to resources and gender stereotyping cause the two to have different LS, which may in turn influence their well-being. The chapter aims to examine this parameter. Chapter Five showed that more educated household heads are better placed to meeting their well-being needs since they have a higher possibility of earning a livelihood from better paying non-farm income sources compared to the less-educated, who may find themselves tied to agricultural production or lowly paid casual work. Therefore, the chapter intends to determine whether households with more educated heads are better placed in terms of the well-being measures being examined. Finally, the importance of land to rural livelihoods cannot be exaggerated, and as shown earlier there is a debate on relationship of farm size to farm households' well-being. There is the possibility that households with larger farms could be able to get higher outputs, enabling them to diversify more; alternatively diversification of LS could enable households with less land to earn more income with which they could purchase more land leading to more output and income, other factors remaining constant. Thus, the chapter will also examine the association between farm size and households' well-being.

After presentation of the conceptual framework in section 7.1, the thesis in section 7.2 examines general well-being in Rukwa. Section 7.3 looks at the relationship between maize farming and the surveyed households' well-being in an attempt to understand the formers contribution to the latter. The section examines the contribution of maize farming to households' income, its relationship with a household's ability to meet its health, education, social costs and ownership of a good quality house. Lastly, the section examines maize farming and a households' asset ownership in 2006 on the basis that this will enable some general understanding of how wealthy the surveyed households were; asset ownership is normally seen as a good proxy indicator of wealth. Section 7.4 examines maize farming as a way out of poverty, and mainly probes views from the respondents because farmers' opinions on the socio-economic importance of crops or products they produce could be an important indicator of the importance attached and/or commitment to the particular crop or product. Finally, section 7.5 briefly compares the well-being between 2006 and 1986 of households' in crop production in 1986 to see whether there have been any significant changes in the context of 20 years of agricultural and other socio-economic reforms undertaken by the Tanzanian government. Section 7.6 presents the conclusions.

7.1 Conceptual framework for determining well-being of the surveyed households

Use of the concept well-being in measuring people's welfare or way of life is a recent development after an increase in criticisms of the old approach of determining people's poverty only on the basis of income and material well-being. According to Gough et al. (2007) despite there being millions of poor people in the developing world it is important that they are looked upon from a perspective of how they are struggling to

achieve well-being for themselves and their children rather than concentrating entirely on their poverty. Gough et al., citing Biswas-Diener and Diener (2001) further argue that poor men and women in developing countries should not be viewed from the poverty perspective only, as despite their deprivations, the poor are able to achieve elements of what they conceive of as well-being. According to Gough et al. the concept of poverty (or rather poverties) is faced with various limitations, and with time, literature around it has become very complex to the extent of becoming confused. Gough et al. (2007:4) also argue that there is a lot of debate "over many different types of poverty; from consumption to income poverty; to poverty defined in terms of the HDI or by social exclusion. Poverty can be relative or it can be absolute". To avoid all this, they advise the best way forward is the use of well-being, a wider concept, which covers and connects the various issues of poverty raised above. They caution that the approach does not abandon concepts of poverty altogether, but uses them in a wider discourse about well-being.

Determination of people's well-being has in the past been mainly based on income levels or expenditure levels of individuals or households (Townsend, 2006). Recently some researchers, for example Sen, (1993) cited by Gough et al. (2007), has argued that a multidimensional approach is necessary to accurately determine people's well-being. According to Townsend (2006) poverty has for a very long time been related to income and therefore the latter has remained at the core of the concept's meaning. However, he argues that despite the advantages of maintaining income in the conceptualization of poverty, income as the case of poverty has various difficulties in conceptualization, so some scientists are trying other ways of conceptualizing income and poverty. For example he suggests inclusion of factors such as income equivalent of assets, free public services and subsidies to employment together with cash income so as to arrive at a comprehensive but accurate measure. He notes that these inclusions make the task of assembling an accurate measure daunting. Townsend further argues that poverty needs to be seen from the broader perspective of how individuals can fulfil the elaborate social demands and customs placed upon them by their society, rather than seeing the poor as victims of a misdistribution of resources. Such an approach is also adopted by Alkire and Deneulin (2009), who argue that well-being should be measured in terms of the ***entire*** distribution of individuals' achievements rather than just on one variable such as income.

Well-being according to Williams (1983) as cited by Gough et al. (2007:4) has its roots in the older English term of 'welfare' traceable back to at least the fourteenth century, during which it meant to journey well and could indicate both happiness and prosperity. In the twentieth century it gradually came to be associated with the assessment of and provision for needs in the welfare state, thus acquiring an increasingly objective, external interpretation. Gough et al. add that in the latter decades of the century, welfare was traced back to its original notion of well-being used as far back as Aristotle and Buddha, mainly due to the emergence of new discourses on agency, participation, and multidimensional views of poverty. As is the case with poverty, well-being as a concept does not have a single definition or conceptualization.

Honderich (2005), cited by Gough et al. (2007) argues that even the new edition of the usually concise and parsimonious *Oxford Companion to Philosophy* defines well-being as "living and faring well" or "flourishing". On the other hand, the Research Group on Well-being in Developing Countries (WeD) defines well-being as; "a state of being with others, where human needs are met, where one can act meaningfully to pursue one's goals, and where one enjoys a satisfactory quality of life."(WeD, 2008:1).

According to Gough et al., well-being can be seen as an 'umbrella concept' embracing at least 'objective well-being' and 'subjective well-being' (SWB). Gasper (2008) notes that objective well-being can be taken to mean 'externally approved, and thereby normatively endorsed, non-feeling features of a person's life such as mobility or morbidity; SWB refers to 'feelings of the person whose well-being is being estimated'. Gough et al. notes that well-being being is a novel category in applied social science hence lacks a settled consensus on its meaning, but allows variety of related ideas and concepts to be included in its conceptualization. Vittersø (2004) shows that objective well-being includes measures such as freedom, justice, medical care, and standard of housing. And SWB comprises people's evaluative responses to their lives, and perceived or subjective experience of well-being.

The introduction to this section has shown that income and material assets are important in determining or enhancing well-being. The chapter aims to assess household income levels for 2005 and their 2006 asset base value. As shown in Appendix 3.4 the study only considers the actual cash inflows reported by households during the survey, which obviously limits the usefulness of the income measure as a measure of well-being, but does give insights into the importance of commercialisation and integration into the cash economy. The asset value used by the study (Appendix 3.4) is based on respondents own valuation. A similar approach to assets consideration is reported by Deere et al. (2009), who point out that the importance of assets to households both in the rural and urban areas, particularly for those in the informal sector is that ownership of consumer durables such as a sewing machine, stove or refrigerator could constitute business assets, enabling a broad range of income generating activities. They argue that in addition to being means of production, some assets such as housing and land can generate rent. Others such as savings, land and business assets could generate some income through profit or interest paid. Assets according to Deere et al. (2009) are also an important buffer during emergencies as they can be pawned or sold to get income or service. Assets also act as an important indicator of a household's potential vulnerability to shocks and possibility of falling into chronic poverty[142]. According to Deere and Doss (2006), cited by Deere et al., assets are also important in generating status and social advantage.

Generally, research literature shows that evaluating well-being can be a difficult exercise. Bookwalter and Dalenberg (2004) argue that the tendency for economic policy in low-income countries to focus on the alleviation of poverty and deprivation on basis of low levels of income and wealth has many limitations,

[142] Addison, et al., (2008) cited by Deere, et al., (2009)

because most measures have focused on poverty from the relationship of money incomes or expenditures with well-being. In a need to broaden the way well-being is measured in Tanzania, the government adopted a new approach which uses a multidimensional approach to measuring well-being. The new approach determines a household's well-being by its ability to meet education, health, social capital costs and ownership of a good quality house with easy access to clean drinking water in the compound. The government further argues that improvement in the quality of life and social well-being depends on the provision, affordability and access to quality food and services like education, information, health, water, HIV and AIDS treatment and prevention, and social protection programmes, and by living in a clean and protected environment free from air and water pollution and mosquito breeding sites (URT, 2005).

Well-being can be determined in various ways; this chapter uses a range of indicators to address the multi-dimensionality of well-being and examines households' well-being along with the wider approach of the Tanzanian government. The study also includes ability to afford a households health, education and social activities costs as perceived by the respondents (subjective well-being) and a household's ownership of a good quality house. This approach allows the research to overcome potential data problems around the measurement of income but also to use a broader range of indicators that may provide different insights into the nature of well-being.

7.3 Well-being in Rukwa

As pointed out in section 3.1.3 Rukwa faces major challenges with regard to living standards of households, with many living in sub-standard dwellings and lacking basic services. About one in three households live below the basic needs poverty line; only seven regions in Tanzania reported a level below that of Rukwa (NBS, 2002). According to NBS only 3% of households in rural Rukwa have dwellings with a modern floor (cement, tiles for their first building), compared to 55% of those in urban Rukwa; and only 8% had modern roofs (metal sheets, tiles, concrete, cement and asbestos sheets) compared with 64% in urban Rukwa.

Table 7.1 shows that well-being was low on several indicators although almost all households thought they were capable of meeting social activities costs. However, the claim by the households to be able to meet their education costs may been made easier by the Tanzanian government's introduction of public schools' grants through PEDP (Primary Education Development Programme)[143]. Terme (2002) points out that the introduction of primary school enrolment fees in 1995 due to the gradual introduction of cost sharing in Tanzania's education throughout the 1980s and 1990s led to a decline in school enrolment. Although the fee never amounted to more than Tsh 2,000 (about 1£) per year, its removal in 2000 led to a

[143] Through this project the government provided exercise and text books to pupils while also paying for schools' recurrent and development expenditures which would have otherwise been met by parents paying school fees and other contributions.

doubling of the number of students enrolled in primary education in 2001/2002. These fees were comparatively onerous to the poor, who tend to have more children as well as fewer resources to pay for them. According to Wedgwood (2005) Tanzania attained almost 100% enrolment during the 1980s when universal free education was provided; however, introduction of cost sharing led to less than 60% of primary school-aged children being in schools by the end of the 20th century. Therefore, it is difficult to explicitly credit the affordability of education costs entirely to the surveyed households as the study found that only a handful of them had children attending secondary school, many aged between 13 and 18 years were staying at home helping with farming and other household income generating activities. The cost of secondary schools is not high in public schools[144], though relatively high in private secondary schools. However, entry into the public schools is by selective examination.

It is not surprising that most households were capable of meeting their social activities costs, because maintaining good social relations is very important in many parts of rural Tanzania where modern financial services like banking and insurance are nonexistent or limited. As a consequence a household's continued involvement in social events of other community members including those requiring monetary contributions, for example send-off parties, marriage and funeral ceremonies, is very important for re-affirming of future mutual support in similar matters or any other calamity that may befall the household. Forgues (2004), cited by OCOL (2007) argues that networks and social ties are a means by which individuals or communities can gain access to resources (economic, political, cultural or human) that are required to achieve certain objectives.

The relatively higher proportion of households not able to meet their health costs comes as no surprise; reasons are twofold. First, most Tanzanians between 1967[145] and the 1990s were not paying for such services. However, this changed in the 1990s after the government adopted the health sector reform (HSR) which led to the introduction of cost sharing in public hospitals in 1993. Secondly, the production levels reported in Chapter Six and the annual cash income levels reported (Table 7.1) suggest households were truly unable to meet their health costs. This finding is supported by the REPOA's (2003) policy and services satisfaction survey (PSSS) cited by URT (2005) in which 73% of the respondents reported health care to have become less affordable in Tanzania in the past five years. Reduction in access to health care after the introduction of user fees has also been reported by Hutton (2002), who argues that many studies in Tanzania have reported a general reduction in health care take-up and that the poor are the most severely affected. Sahn and Stifel, (2003) point out that consumers in Tanzania are highly responsive to the price of health care and that this effect is even greater for individuals at the lower end of income distribution.

---

[144] This refers to schools owned and operated by the Tanzanian government.

[145] In the 1967 Arusha Declaration Tanzania was declared a socialist state, with public services costs including those on health and education being incurred by the government.

According to Table 7.1 a relatively higher percentage of households in Mpanda unable to meet their health and educational costs is surprising as about 45 percent of the households were involved in tobacco farming, a cash crop. Although not of immediate concern to the current study, the relatively low ability of households in Mpanda to meet their health and education costs raises the question as to whether their tobacco productivity was high enough to offset the costs involved in its production and obtain a profit margin high enough for households to use in access to social services like health and education. Hammond (1997), and Rweyemamu and Kimaro (2006) argue that smallholder tobacco farmers are not benefiting as much as hoped from their production and the liberalization of the tobacco market respectively. The latter add that the lack of real benefits emanates from inefficiencies in both the production process and the marketing, and that these farmers' overall benefits are meagre in relation to the international market prices. Although their study showed tobacco production to be potentially profitable based on the international market, smallholder tobacco producers are paid less than the actual value of their product.

Table 7.1 also shows that despite Nkansi reporting a lower 2005 household cash income the district had a higher asset value. This may partly be due to a significant number of households in the district owning cattle, as pointed out earlier in Chapter Five(section 5.5.2) compared with those in Sumbawanga or Mpanda districts. A few households had more than a 100 cows and this could be a cause of the inflated asset value. The higher average annual 2005 income observed for Mpanda district is mainly explained by the fact that about 45 percent of the households surveyed in the district sold tobacco, which boosted their incomes relative to those reliant on sale of maize and other food crops only.

Table 7.1: Well-being indicators

Characteristic		Rukwa region	District		
			Sumbawanga	Mpanda	Nkansi
Ability to meet health service costs		n=188	n = 69	n = 58	n = 61
	Yes	73(38.8)	30(43.5)	12(20.7)	31(50.8)
	No	115(61.2)	39 (56.5)	46(79.3)	30(49.2)
Ability to meet educational costs		n = 150	n = 61	n = 43	n = 46
	Yes	88(58.7)	36(59)	23(53.5)	29(63)
	No	62(41.3)	25(41)	20(46.5)	17(37)
Ability to participate in social activities requiring cash		n=199	n=72	n=66	n=61
	Yes	179(89.9)	62(86.1)	61(92.4)	56(91.8)
	No	20(10.1)	10(13.9)	5(7.6)	5(8.2)
Quality of house owned		n=199	n = 71	n = 67	n = 61
	Good	69(34.7)	23(32.4)	23(34.3)	23(37.7)
	Poor	130 (65.3)	48 (67.6)	44 (65.7)	38 (62.3)
		n = 200	n = 72	n = 67	n = 61
Average 2005 cash income (Tsh)		521,947.00	475,069.40	704,411.00	376,866.60
Average 2006 assets value (Tsh)		1,690,738.00	734,693.00	1,290,489.60	3,258,801.60

Source: Own survey 2006, *NB*: Numbers in brackets indicate percentage[146].

7.3 The relationship between maize farming and households' well-being

This section examines the contribution of maize farming to the surveyed households' well-being. Ellis and Mdoe (2003) have shown from their Morogoro study that maize has an important role in rural farm households' well-being: maize accounted for 40.5%, 30.1%, 27% and 7.8% of the households' consumption for the I, II, III and IV income quartiles respectively. The study further showed that the overall household income share of maize was 27.1, %, 21.5%, 15.1% and 7.9% respectively for the above-mentioned income quintiles. In Rukwa, Ashimogo (1997) reporting showed that income from maize sales in Sumbawanga accounted for over one-third of total household cash income. RATES (2003) point out that about 85 % of Tanzanians depend on maize as an income-generating commodity. Based on reported household income contributions and the fact that previous chapters showed some households only grew or sold maize, the chapter examines the extent to which maize was important to households. Sub-section 7.3.1 examines the role of maize; as a source of income, in assets and maize farming and households' ability to meet costs for health, education and social activities. Lastly, sub-section 7.3.2 looks at the factors influencing the surveyed households' income, assets value and their ability to meet costs for health, education and social activities.

The above examinations will enable a better understanding of the importance of maize to rural farm households, but also give some clues as to what could be done by policy makers and agricultural

[146] The difference in n for each well-being measure is a result of the number of respondents that answered the question related to the measure. For example some households did not have children in school at the time of study so were unable to respond to the question on affordability of education.

extension staff to raise smallholders maize yield and hence income, in order to improve the well-being of the millions reliant on maize production as a livelihood strategy. The contribution of other crops to the surveyed households will be measured by either the regression or logistical regression models used in determining the households' capabilities to meet their education, health, social capital costs, households' income and their asset values for 2005 and 2006 respectively.

7.3.1 Maize farming as a source of household cash income

Apart from being a major food crop maize is sold by many households to earn income to spend on other needs, such as other food stuffs (meat, fish, rice, cooking oil, sugar, salt), kerosene for lighting, clothes, and building materials to mention but a few. Therefore, it's imperative to examine the relationship between cash income accrued from maize and its produces' well-being. An understanding of this could enable policy makers and agricultural extension staff to devise appropriate initiatives aimed at raising smallholders' maize yields from the current low levels as observed in Chapters Four and Six. Such a move would enable smallholders to earn more cash income which could then be used for improvement of rural lives not only in Rukwa, but in other parts of Tanzania too.

Chapter Six showed about three quarters of the respondents normally sell part of the maize they produce and households selling maize were generally more productive than those that did not. Table 7.2 shows that income from maize sales contributed on average about 25% of the surveyed households' 2005 annual cash income; the contribution was highest in Nkansi and lowest In Mpanda. This observation is consistent with the official Rukwa estimate that maize sales represent around a third of household income. The observed 'inverted U relationship between households' incomes and share of income from maize sales could be a result of two factors at work; poorer farmers having less land and needing to consume more of the harvest, and the richest farmers growing less maize so having less to sell. Somewhere in the 3rd quartile farmers are producing less maize. Ashimogo (1997) has reported observations similar to the above for Sumbawanga, where income from maize accounted for about one-third of total household cash income.

Table 7.2.: The contribution of maize sales to household income in 2005 (n =200)

	Characteristic	Maize income from sales as a % of household income	Households average income(Tsh) in 2005
Quartile	I	24.06	72,000
	II	27.38	200,720
	III	33.87	407,137
	IV	12.21	1,407,960
District	Sumbawanga (n = 72)	27.48	475,069
	Mpanda (n = 67)	12.13	704,411
	Nkansi (n = 61)	34.17	376,867
Overall average		24.38	521,947

Source: Own survey 2006

In relation to other variables that measure the importance of maize, results in Table 7.3 show that households allocating up to a third of their farm to maize production reported a higher 2005 average income compared to those allocating more land. Furthermore, more commercialised maize producers i.e. those selling more than two thirds of their produce, had a higher average income relative to those selling less. Lastly, the Table shows that the greater the number of crops grown by a household, the higher its income was in 2005. Generally, these observations seem to suggest that commercialization of crop production by households was associated with higher incomes and that a greater reliance on maize is associated with poorer outcomes. As pointed out by Spring (2000) commercialization of agricultural production is key to a household's food security and general well-being.

7.3.2 Maize farming and asset ownership

Asset ownership by a household is a good proxy indicator of wealth[147] as determining a household's actual income can be a difficult exercise[148]. Therefore, estimating their assets gives a clue as to how households have utilized income earned. Furthermore, assets' value can potentially be used by households as collateral for loans which could at times be necessary for enhancing a household's well-being, either for production purposes, or to address emergency needs such as illness or calamities such as floods and droughts (Deere, et al., 2009). Therefore, knowing a households asset base gives a better picture of the capacity of individuals to manage their vulnerability to poverty. This section aims to examine the relationship between maize farming and the surveyed households' ownership of assets in 2006 so as to establish how households perform on the basis of amount sold.

Table 7.3 shows that farmers who were more commercialised and less reliant on maize for their livelihood had a higher mean asset value. Households that allocated more than one third of their land to maize had a lower mean asset value. Asset values in 2006 varied on the basis of the surveyed household's district of residence, and their sale of crops. The observations suggest two things. First, households receiving a large part of their cash income from maize sales were poor (had low asset values); secondly, that those who had no maize sales were also poor, so presumably had no maize surplus. This might be because they were poor or had little land so could only grow enough maize for their own needs. On the other hand they could in theory be farmers who chose to only grow a small amount of maize because they had income from other sources. Observations also show that a higher asset value was reported by households growing three other crops in addition to maize as compared to those growing less or more than three. In sub-section 7.3.3 the thesis examines the relationship between maize farming and a household's ability to meet costs of basic services such as head and education.

---

[147] According to URT (2001) a proxy indicator like asset ownership can be a valid indicator for income poverty. Proxy indicators can provide estimates for impact and outcome indicators that are difficult and expensive to measure as they correlate strongly with the latter.

[148] Setboonsarng (2005) has argued that use of income levels as an indicator of poverty, though practical, could be limited by problems of reliability, cost effectiveness, timeliness, and comparability across countries.

Table 7.3: Households' income (2005) and assets (2006) (n = 200)

Characteristic		Households average income value (Tsh) 2005	Households average assets value (Tsh) 2006
% of land allocated to maize in 2005	0% (n = 9)	515,111	455,567
	0.1 to 33.33 % (n = 31)	699,000	4,313,336
	33.4 % to 66.67 % (n = 100)	603,614	1,230,583
	More than 66.67 % (n = 36)	295,383	1,287,930
% of maize sold by household income	0% (n = 97)	539,495	1,282,597
	0.1 to 33.33 % (n = 29)	371,517	656,017
	33.4 % to 66.67 % (n = 58)	446,007	1,581,112
	More than 66.67 % (n = 16)	963,497	6,437,919
Maize income as a % of household income	0% (n = 97)	539,495	1,282,597
	0.1 to 33.33 % 2005 (n = 44)	618,250	2,681,225
	33.4 % to 66.67 % (n = 29)	522,462	2,013,735
	More than 66.67 % (n = 30)	323,465	1,245,450
Number of crops grown by household	0 (n = 2)	90,000	326,396
	1 – 2 (n = 93)	349,790	750,181
	3 (n 60)	620,859	3,235,855
	More than 3 crops (n = 45)	765,053	1,879,891
Crop sales	Household sells maize only (n=18)	472,500	694,750
	Household sells other crops only (n=36)	642,432	1,754,314
	Household sells both maize and other crops (n=133)	510,010	1,933,609
	Household does not sell any crops (n = 13)	378,885	408,985

Source: Survey data 2006

7.3.3 Maize farming and households ability to meet costs for health, education, social activities costs and their ownership of a good quality house in 2006

This sub-section examines how maize farming is related to households' ability to meet their health services, education and social activities costs and their ownership of a good quality house in 2006. Examining the above attributes by mainly focusing on maize farming to reveal how households are performing in the context of twenty years of agricultural reforms that included liberalization of the maize market in 1986. Major emphasis will be placed on percentage of land allocated to maize farming, the percentage contribution of income from maize sales to household income in 2005 and households' general sale of crops.

Generally, Table 7.4 shows that more commercialised households were better able to meet their health and education costs. For example a higher proportion of households selling more than 50 % of the maize they produced thought they were more capable of meeting the above costs as compared to those selling less. Surprisingly, the Table further shows that a relatively higher proportion of households selling maize only thought they were more capable of meeting their health costs compared to those selling both maize and other crops, or those selling other crops or no crops at all. This observation seems to suggest that

with the commercialization of maize production households could be capable of meeting their needs. It is further supported by the 2009 HDR by UNDP (2009), which reports that Tanzanian farm households that diversified their crop production to food crops for their own consumption and other non-traditional cash crops (vegetables, fruit, and vanilla) were the most successful in moving out of poverty. Therefore, households that had commercialized their maize production were not only able to meet their food needs but also to earn cash income necessary for other household needs, such as meeting health and education costs.

The capacity for maize farming to be relied upon by households in Tanzania has also been reported by Maghimbi (2007) who states households in Kilimanjaro have been reported to be foregoing production of coffee a long established cash crop in the region, for maize and rice production. Section 7.4 also shows that respondents from the current study were confident that maize farming could be a way out of poverty. It also shows that households' ability to meet their health and education costs was relatively high for those to whom cash from selling maize contributed more than 50 % of the household's 2005 cash income, compared to those where income from maize contributed less.

Generally, commercialization of maize production was also observed to be important in households' ability to meet their social activities costs. Table 7.4 shows that households selling a higher proportion of the maize they produced claimed to be more capable of affording these costs. Commercialization into other crops was also associated with households claiming to be capable of meeting their social activity costs. Households selling both maize and other crops thought they were capable of meeting the above costs compared to those selling maize only, other crops only or those selling no crops at all.

Table 7.4 shows that commercialization of crop production both in terms of maize production or crop diversification was associated with ownership of a good quality house in 2006. A relatively higher proportion of households selling more than 50 % of the maize produced and those selling both maize and other crops owned a good quality house in 2006, as compared to those selling less maize, selling either maize only, other crops only or those not selling crops at all.

In summary, the results show that commercialization of crop production both in terms of allocating less land to staples or increase in the share of marketed output is important to households' general well-being. Those allocating less land to maize production and those growing many crops were generally seen to be more able to meet their health, education, social relations costs and to own a good house. Diversifying crops grown could be a coping strategy by households against fluctuating market situations ensuring that they have a means of survival in case of failure of one crop in the event of either output or market failures. These households were also less poor in terms of assets owned and cash income earned.

Table 7.4: The contribution of maize farming to households' well-being in Rukwa

Characteristic		Households' ability to pay for health		Households' ability to pay for education		Households' ability to pay for social activities		Households' ownership of a good house in 2006	
		No	Yes	No	Yes	No	Yes	No	Yes
% of land allocated to maize in 2005	0% (n = 9)	5 (55.6)	4 (44.4)	5 (71.4)	2 (28.6)	2 (22.2)	7 (77.8)	7 (77.8)	2 (22.2)
	0.1 to 33.33 % (n = 31)	21 (77.8)	6 (22.2)	11 (55.0)	9 (45.0)	1 (3.2)	30 (96.8)	24 (77.4)	7 (22.6)
	33.4 % to 66.67 % (n = 100)	52 (55.9)	41 (44.1)	20 (28.6)	50 (71.4)	9 (9.1)	90 (90.9)	59 (59.0)	41 (41.0)
	More than 66.67 % (n = 36)	37 (62.7)	22 (37.3)	26 (49.1)	27 (50.9)	8 (13.3)	52 (86.7)	40 (67.8)	19 (32.2)
% of maize sold by household income	0% (n = 97)	67 (76.1)	21 (23.9)	35 (47.3)	39 (52.7)	13 (13.4)	84 (86.6)	71 (73.2)	26 (26.8)
	0.1 to 33.33 % (n = 29)	15 (57.7)	11 (42.3)	8 (44.4)	10 (55.6)	5 (17.9)	23 (82.1)	20 (71.4)	8 (28.6)
	33.4 % to 66.67 % (n = 58)	25 (43.1)	33 (56.9)	15 (32.6)	31 (67.4)	1 (1.7)	57 (98.3)	31 (53.4)	27 (46.6)
	More than 66.67 % (n = 16)	8 (50.0)	8 (50.0)	4 (33.3)	8 (66.7)	1 (6.2)	15 (93.8)	8 (50.0)	8 (50.0)
Maize income as a % of household income	0% (n = 97)	67 (76.1)	21 (23.9)	35 (47.3)	39 (52.7)	13 (13.4)	84 (86.6)	71 (73.2)	26 (26.8)
	0.1 to 33.33 % 2005 (n = 44)	26 (61.9)	16 (38.1)	13 (39.4)	20 (60.6)	5 (11.4)	39 (88.6)	29 (67.4)	14 (32.6)
	33.4 % to 66.67 % (n = 29)	15 (51.7)	14 (48.3)	6 (28.6)	15 (71.4)	0 (0.0)	28 (100.0)	17 (58.6)	12 (41.4)
	More than 66.67 % (n = 30)	7 (24.1)	22 (75.9)	8 (36.4)	14 (63.6)	2 (6.7)	28 (93.3)	13 (43.3)	17 (56.7)
Number of crops grown by household	0 (n = 2)	2 (100.0)	0 (0.0)	2 (100.0)	0 (0.0)	2 (100.0)	0 (0.0)	2 (100.0)	0 (0.0)
	1 – 2 (n = 93)	59 (64.8)	32 (35.2)	34 (44.7)	42 (55.3)	11 (12.0)	81 (88.0)	67 (72.0)	26 (28.0)
	3 (n 60)	27 (50.9)	26 (49.1)	15 (35.7)	27 (64.3)	5 (8.3)	55 (91.7)	35 (59.3)	24 (40.7)
	More than 3 crops (n = 45)	27 (64.3)	15 (35.7)	11 (36.7)	19 (63.3)	2 (4.4)	43 (95.6)	26 (57.8)	19 (42.2)
Crop sales	Household sells maize only (n=18)	6 (35.3)	11 (64.7)	3 (25.0)	9 (75.0)	3 (16.7)	15 (83.3)	12 (66.7)	6 (33.3)
	Household sells other crops only (n=36)	22 (73.3)	8 (26.7)	8 (38.1)	13 (61.9)	2 (5.6)	34 (94.4)	27 (75.0)	9 (25.0)
	Household sells both maize and other crops (n=133)	77 (59.2)	53 (40.8)	43 (40.6)	63 (59.4)	12 (9.1)	120 (90.9)	78 (59.1)	54 (40.7)
	Household does not sell any crops (n = 13)	10 (90.9)	1 (9.1)	8 (72.7)	3 (27.3)	3 (23.1)	10 (76.9)	13 (100.0)	0 (0)

Source: Survey data 2006

7.3.4 Factors influencing the surveyed households' income, assets and their ability to meet costs for health, education and social activities.

This section examines in detail household well-being using simple regression analysis models (Table 7.5). The models are based on the hypothesis that some farm characteristics, household characteristics and location may have influenced households' annual income and assets. This allows the hypotheses elaborated on in the introduction to be explored in a multivariate way. Two models are estimated for income and assets, using ordinary least squares[149]. The first model uses households' natural logarithm of their annual income, while the second model uses the natural logarithm of the surveyed households' asset value as its dependent variable. A common set of independent variables is used. The use of the natural logarithm of income and assets value was mainly based on the fact that the relationship between the above dependent variables is not linear; in addition there is a likelihood that natural limits could be in operation for both income and assets value. The section also uses binary logistic regression analysis to determine the association between some farm characteristics, household characteristics and location to the surveyed households' claim of ability to meet their health services, education and social capital costs and their ownership of a good quality house in 2006. The first model aims to investigate the importance of farm, household and location characteristics on households' ability to meet their health costs; the second model uses ability to meet household's education costs as its dependent variable. The third and fourth use ability to meet social activities costs and a household's ownership of a good house in 2006 as their dependent variables respectively, the logistic models use the same set of independent variables applied in the regression models above.

First a set of farm characteristics and farming method variables are specified. These include:

- Total farm size (in ha), which is intended to shed light on the influence of farm size on rural households' well-being.
- Three further variables, the proportions of land dedicated to maize production and to cash crops, and whether the household sells maize, capture the extent to which farms rely on maize or have access to other forms of incomes. It might be expected that households with a large part of land dedicated to cash crops put less effort into their production of maize as they do not rely on income from selling maize. Conversely farmers with a large part of land dedicated to maize may have higher output, hence more surplus to sell.
- Number of crops grown and livelihood strategies adopted by households are also included as these may also mean farmers are less reliant on maize production for their well-being.

[149] The models use OLS simply because the aim is to examine correlations and associations, rather than conduct a formal econometric analysis. It is possible that some of the independent variables are correlated with each other and that some are endogenous, for example high yields or high output levels may actually determine if a household sells maize.

- A set of variables that capture input use are also included: use of fertilizer, type of maize seed, use of extension staff, and use of oxen for tilling land, aiming to capture the benefits of improved farming practices that are associated with higher yields elsewhere. Higher outputs would also mean more crop is available to sell, hence more income and presumably more ability to invest in assets and meet other well-being needs.

The second set of variables includes key household characteristics such as age, gender and education of the household head and household size. These aim at capturing their influence on the households' income, assets value and the ability to meet their health, education, social activities costs and their ownership of a good house. For example literature shows that education can determine what types of LS a household can access and also determines the efficiency in their execution; gender on the other hand has also been shown to influence access to assets and type of LS. Household size aims to capture the influence of large sized rural households on well-being; while they may be able to easily supply the labour required for their crop production their needs are also higher.

The final set of variables of district dummies aims to capture other characteristics that are not measured by the above, for example access to non-farm income generating activities, or input and output prices or price of other household necessities. Results of the simple linear and binary logistic regressions are presented in Table 7.5.

The first point to note is that the fit of the asset model is relatively lower compared to the income model. This suggests that there are other factors determining variations in asset ownership that are not included in this model. Nevertheless, the F statistics show that the models are useful for shedding light on both household income and their assets value. Regarding farm characteristics and farming methods, several appear to be significantly associated with income, but not assets. These include proportion of farm land allocated to maize production, proportion of maize sold, and the contribution of maize sales to household income; the influence of these on income was statistically significant. On the other hand number of crops grown by households was only significant for assets value but not income.

The observation that households allocating more land to maize production have lower incomes and a low asset base comes as no surprise given the yield and output levels reported in Chapter Six. Observations in that chapter showed that the level of commercialization of food crops was relatively low, as increase in land under maize production did not in itself translate into higher yields so households may not necessarily have got enough for their own consumption and surplus to sell to earn income. In this situation those reliant on maize sales as their major source of household income were hit hardest. Surprisingly, the regression results also show that an increase in the percentage of farm land allocated to cash crops was significantly (0.05 level) associated with lower 2006 household asset values. The only explanation for this

based on the study's data limitations is that observations in Chapter Six showed that households' crop yields were relatively low and this meant lower outputs overall. Given the low proportion of farm land allocated to cash crops, the negative impact on assets may be unavoidable, as some cash crops, for example tobacco, require a lot of investment in inputs and labour. In addition in section 7.2 evidence from literature questioned the profitability margin of tobacco, the major cash crop in Mpanda (Hammond 1997 and Rweyemamu and Kimaro, 2006). In addition households producing less food would need to buy food from the markets, sometimes at higher prices, and this may have been a cause of a lack of positive influence of cash crops on a household's asset base.

It is a general assumption that with increase in age one should have more assets and wealth (Green et al., 2009). Surprisingly, observations from the regression analysis show that household income declined with increase in the age of a household head. This observation may partly be explained by the nature of LS available in the study area, given the fact that the major source of livelihood was crop production; considering the poor technologies used by households (see Chapter Six) and the drudgery involved, households with older heads and fewer youngsters may find it hard to produce enough for both their own consumption and surplus to sell and so earn less. Lastly, the location dummy was only significant for a household's asset value, confirming the summary statistics (Table 7.4).

In relation to the logistic regression analysis to check for the association of farm, household and location on a household's ability to meet their health, education, social activities costs and to own a good house, a general observation from the four logistic models estimated (Table 7.5) is that the strength of association between the independent variables and the dependent was not very high as measured by the Nagelkerke's R^2. This suggests that there are other factors associated with the surveyed households' ability to meet their health, education, social capital costs and ownership of a good house which are not included in the models. One important omission could be the governments' subsidization of education and health costs, but how to determine the cost of this was unfortunately beyond the scope of the current study. Nevertheless, all the Model χ (chi) show that the models are useful for shedding light on the surveyed households' ability to meet the above mentioned costs and their ownership of a good house in 2006.

On farm characteristics and farming methods, results show that a household's farm size was associated with both a household's ability to meet their social activities costs, and their ownership of a good house in 2006 with association with the latter being very strong. On the other hand income from maize was positively associated with a household's ability to meet their health costs. Observations from the study (Table 7.5) further show that the number of livelihood strategies adopted by households was significantly and positively associated with their ability to meet their health costs and education costs. A household's tillage method was, according to the results, also positively and significantly associated with its ability to own a good house. This observation means that less tedious methods of land preparation can allow

households to expand their farms in a less exhausting way and to save energy for other farming operations such as weeding or even other livelihood strategies that could increase household income. Due to the very strong association between farm size and ownership of a good house shown above, the assumption is that use of oxen does enable households to easily expand their farms and greater ability to grow a bigger crop (in the case of monoculture) or several crops grown. In this way households can ensure larger harvests and either more surpluses to sell or different crops for sale, giving a higher income base, which can be used to address the various needs of a household including construction of a good quality house. Furthermore, increases in sales of other crops such as tobacco, sunflower, oil seeds and beans enable households to earn more cash, and because these crops fetch a better price, households involved in their sale stand a better chance of earning enough cash for investment.

Regarding household characteristics, several appear to be significantly associated with a household's ability to meet health costs, but not education and social capital costs. Nevertheless, household heads gender was significantly associated with ownership of a good house; the likelihood of male headed households owning a good house in 2006 was higher than for the female headed households. This observation confirms other findings (FAO 2007 and Horrel, 2008) which show that women's access to resources, particularly in the developing countries, is limited.

The logistic regression results (Table 7.5) have also shown household heads gender was associated with a household's ability to meet education needs; MHHs thought they were on average less able to meet their education costs despite the government subsidization of the services pointed out earlier. The results also suggest that a unit increase in a household head's age was negatively and significantly associated with the likelihood that a household would be less capable of meeting their health and education costs.

Finally, the district dummies show the presence of a statistically significant association between a household's district of residence and their ability to meet their health costs and ownership of a good quality house. This observation confirms earlier claims by households in Mpanda that they were less able to meet their health costs. This observation is contrary to expectations as with many households in Mpanda growing tobacco as their main cash crop the general expectation would be for them to be able to meet their needs and even own a better house.

Generally, observations from the regression are consistent with expectations. For example, literature shows that commercialization of agricultural production is vital for rural households well-being for it enables them to produce higher output more efficiently, and earning more income, which is vital for their well-being be it meeting health or other needs. This is supported generally by the regression results on percent of maize sold and percent of land allocated to cash crops; the percentage of maize sold was highly significant to a household's income, suggesting that farmers who had commercialized their maize

production were able to earn higher incomes. However, the proportion of farm allocated to cash crops was only slightly significant: the slightly significant contribution of cash crops to household income may be due to the fact that overall these were allocated less than twenty percent of the farm, minimizing their contribution. Furthermore, the low yield levels observed in Chapter Six means outputs were also low, and income similarly low.

The regression analysis further suggests that households with many LS were more capable of reporting higher incomes and meeting their health and education costs. This does not necessarily imply causation but is suggestive of the importance of various livelihood strategies to a household's well-being. Households with alternative sources of income are capable of playing the waiting game before selling their crops, which allows them to get better prices and hence more income compared to those who sell just after harvesting when there is plenty of produce and prices are low. Farm size is also a very important factor associated with a household's well-being. Some of the results confirm expectations, whereas others are more surprising, for example the lack of a significant positive association of age to income, and ability to meet households' needs of health, education, social relations and ownership of a good house. Regarding income levels however, the results are much stronger and more consistent with expectations.

It can be concluded from the regression analysis that a lack of commercialization of maize production by households reliant on the crop as a source of household income were in danger of being trapped deep into poverty due to their lower incomes reported, relative to those commercializing their production or those diversifying into cash crops. Other factors that significantly affected a household's income, asset base or both were age of household head and location. Based on the logistic regression, the chapter concludes that households' perceived ability to meet their health, education and social activities costs and their ownership of a good quality house were driven by various factors. Number of livelihood strategies adopted by households was more important in households' ability to meet their health and education costs; as expected gender had an important role in the surveyed households' ability to own a good house. One surprising result however was the relatively lack of ability by households in Mpanda to meet their health needs and ownership of good houses despite the fact that the district grows tobacco as a major cash crop. Lastly, it can be concluded that the influence of farm size on rural households' well-being was relatively much stronger and more consistent with expectations.

Table 7.5: Simple linear and binary logistic regression analysis results for some household well-being indicators (n= 200)

Characteristic	Ln income 2005[a]	Ln asset value 2006[b]	Ability to meet/own			
			Health costs[c]	Education costs[d]	Social relation costs[e]	A good house 06[f]
	B (SE)	B (SE)	B (SE)	B (SE)	B (SE)	B (SE)
Households farm size (ha)	.213*** (.051)	.234*** (.072)	-.062 (.132)	.180 (.161)	1.136** (.464)	.756*** (.172)
% of a household's farm land allocated to maize production	-.009** (.003)	-.006 (.005)	-.006 (.009)	.012 (.011)	-.009 (.014)	.006 (.010)
% of a household's farm land allocated to cash crops	.007* (.004)	-.014** (.006)	.006 (.011)	.018 (.014)	-.014 (.016)	-.023** (.012)
Households sells maize only (1=yes; 0=no)	-.176 (.284)	-.351 (.397)	.945 (.757)	.958 (.990)	-1.218 (1.049)	.510 (.830)
Household's sells both maize and other crops (1=yes; 0=no)	-.303 (.196)	-.030 (.274)	-.250 (.565)	-.021 (.591)	-1.069 (.771)	.142 (.571)
Maize income as a percentage of 2005 household income	-.010** (.003)	-.002 (.004)	.025** (.008)	.004 (.010)	.004 (.015)	.006 (.008)
% of produced maize sold by household	.015*** (.004)	.007 (.005)	.001 (.010)	-.005 (.012)	.008 (.019)	-.010 (.010)
Number of crops grown by household in 2005	052 (.083)	.197* (.116)	.031 (.214)	-.135 (.250)	-.251 (.450)	.050 (.227)
Number of livelihood strategies adopted by household	.127** (.066)	-.172* (.093)	.468** (.183)	.526** (.223)	.422 (.309)	-.140 (.186)
Household's use of fertilizer in maize production (1=yes; 0=no)	.331** (.158)	.370* (.221)	.415 (.424)	-.528 (.522)	-.358 (.695)	.378 (.429)
Household's use of improved maize seeds (1=yes; 0: no)	-.041 (.158)	-.083 (.221)	.321 (.422)	-.677 (.584)	.194 (.676)	.398 (.408)
Household use of extension services (1=yes; 0 = no)	-.102 (.145)	-.133 (.202)	.033 (.393)	-.500 (.457)	-.729 (.637)	-.474 (.401)
Household's tillage method (1=oxen; 0= hand hoe)	-.126 (.182)	.367 (.255)	.117 (.477)	.276 (.558)	.490 (.783)	1.557** (.523)
Household's head age	-.015** (.006)	.006 (.008)	-.028* (.017)	-.036** (.019)	-.027 (.023)	-.001 (.017)
Sex of household's head (1=male; 0=female)	-.038 (.191)	-.201 (.267)	-.752 (.535)	-1.302** (.599)	-.273 (.700)	1.255** (.507)
Actual school years of household's head	.030 (.030)	.067 (.042)	-.047 (.084)	.126 (.084)	.096 (.127)	.116 (.086)
Household size	.010 (.026)	-.010 (.037)	-.020 (.074)	.061 (.087)	-.038 (.110)	.021 (.074)
Sumbawanga district (1= Sumbawanga; 0= otherwise)	-.100 (.194)	-.786** (.272)	.901* (.545)	.264 (.601)	-.763 (.846)	-.924 (.565)
Nkansi district (1:Nkansi; 0= Otherwise)	-.136 (.220)	-.347 (.308)	1.057* (.599)	.433 (.658)	-.070 (.940)	-1.540** (.640)
(Constant)	12.595***(.618 F= 8.067***	12.819***(.863) F= 4.605***	-.464 (1.727)	.133 (1.936)	3.085 (2.728)	-4.308** (1.745)

NB: ***Significant at 1% (0.001) level, **Significant at 5% (0.05) level and * Significant at 10 % (0.1) level

[a] Linear regression model for Ln 2005 household income [a] Linear regression model for Ln 2006 household assets value

[c] Binary logistic regression model: Note R^2 =0.243 (Cox & Snell R^2), 0.330 (Nagelkerke R^2). Model $\chi^2(19) = 52.356$***

[d] Binary logistic regression model: Note R^2 =0.258 (Cox & Snell R^2), 0.347 (Nagelkerke R^2). Model $\chi^2(19) = 44.668$***

[e] Binary logistic regression model: Note R^2 =0.155 (Cox & Snell R^2), 0.323 (Nagelkerke R^2). Model $\chi^2(19) = 36.449$ **

[f] Binary logistic regression model: Note R^2 =0.269 (Cox & Snell R^2), 0.371 (Nagelkerke R^2). Model $\chi^2(19) = 62.338$***

7.4 Maize farming as a poverty escape

In the last two sub-sections we have seen the importance of income from maize sales to a household's cash income and general well-being, for example to meet food, health and asset build up. In this section the thesis tries to assess maize farmers' views on maize farming's potential for rural poverty reduction or its contribution towards further improvement of rural households' well-being. Farmers' opinions on the socio-economic importance of crops or products they produce are an important indicator of the importance attached and/or commitment to the particular product. Opinions offered on maize production by the respondents of the surveyed households can offer an insight into the actual effectiveness of the crop on the well-being of the households. According to ODI (2002) agriculture can be an engine for rural growth and poverty reduction, though this may not be uniform in all places. Describing a study on Ethiopia, Diao and Pratt (2006) have shown that agriculture can play an important part in decreasing poverty and increasing growth, and that staples (cereals, root crops, pulses, and oil crops) have great potential as income sources for the majority of small farmers. The above situations will for a long time be applicable to many of the rural residents in Sub-Saharan Africa, Tanzania included. In reality, this part of the continent lacks suitable alternative sources of livelihood due to lack of industrialization and the underdevelopment of the financial and social service sectors, especially in the rural areas. Therefore, opinions from the surveyed farmers could help shape strategies by Tanzanian policy makers and agricultural extension staff in their quest to improve rural farm households' well-being.

Approximately three quarters of the respondents considered maize farming to have the potential of enabling improvement of households' well-being (Table 7.6). At the district level Sumbawanga had the highest positive response followed by Nkansi. The relatively lower response by respondents in Mpanda district may be caused by many farmers in Mpanda being able to grow tobacco as their cash crop; tobacco has a higher income earning capability than maize. Furthermore, many households only saw maize as a food crop rather than a cash crop (See respondents' quotations below). Such a view is also popular amongst politicians, who during electoral campaigns or parliamentary sessions promise farmers or demand the government to introduce cash crops to their areas. Consequently, maize is only seen as a food crop, and less effort is directed to support maize production as a potential income earner. However some few projects aiming at making rural households food secure have been executed. On the other hand there have been numerous extension efforts directed to export crops such as cotton, tobacco, coffee and cashew nut; enabled by these crops having boards that closely monitor production and marketing. Although most respondents were confident that maize farming has potential for households' poverty reduction, most added some preconditions to this, as presented in the next paragraph[150].

[150] The respondents' and the FGDs participants' definition of poverty suggests that it may be very hard for a government or NGOs to help in reducing rural poverty. Although empirical evidence from the current study suggests most of the surveyed farm households fall into the poor category, most respondents and FGDs participants saw the poor as either people with disabilities (including the blind, deaf, and crippled), the elderly, those in poor health, those without farming equipment and/or development. Though some did mention lack of assets, income and development

Generally, farmers optimistic that maize farming had the potential of getting households out of poverty thought this could only be achieved if it was carried out more efficiently. They argued that it was only through use of modern technologies such as chemical fertilizers, improved seeds and professional advice from extension staff that poverty reduction or general improvement of maize farmers' well-being could be achieved. Nevertheless, they were worried that without a rise in maize prices their efforts could still end in vain. They thought that for maize production to make the necessary contribution towards poverty reduction, the government should; play an active role, ensuring that buyers do not pay too little for their produce and that farmers can access inputs at affordable prices, in contrast to the current situation. Below are a few quotes that reflect the respondents' optimism and worries:

> "Yes, it's possible for maize farming to reduce poverty in our area, for example if one gets a good price for the maize, then one can be able to build a good house and even educate his/her children." (A farmer in Sumbawanga district)
>
> "Yes, maize farming can reduce one's poverty if one is knowledgeable and seeks agricultural advice from qualified extension staff. This could enable one to produce surplus to sell and earn income to overcome poverty". (A young male farmer in Mpanda district)
>
> "Yes, maize farming can enable one to get out of poverty in our area; for example due to maize farming, one farmer has been able to build a modern house using burnt earth bricks and corrugated iron sheets and he expects to build another house after the rainy season" (A farmer in Nkansi district).

The quotations above are supported by observations from the FGDs and in-depth interviews with the concerned districts' agricultural officers (DAOs), in which participants generally agreed that there was a possibility of reducing poverty through maize farming. They added that for this to happen, efforts needed to be in place to educate farmers on modern farming techniques and the inputs needed to be available at the right time and at affordable prices. The FGDs participants fully agreed that with the current maize yields it was quite impossible to reduce households' poverty through maize farming. Generally, observations from the surveyed households, the FGDs and DAOs indicate that households may have not responded adequately to a liberalized maize market, through lack of resources and/or knowledge. While liberalization has assured availability of buyers it has made access to inputs more difficult than before.

Respondents were very pessimistic about maize farming's potential to improve rural well-being in Rukwa, mainly because most of them saw maize as a food crop rather than a dual purpose crop. They also argued that in comparison to other crops like sunflower, beans or tobacco (in Mpanda) maize fetched a low price in relation to the production costs incurred. They added that overdependence on one crop could risk the family's well-being, especially in relation to food security. Since most of the respondents saw maize as a food crop, doubts about its ability to contribute to well-being improvement were based on fear

---

as characteristics of the poor, many seemed to see poverty from a very different angle to that of development agencies and governments. This perspective might hinder efforts to fight individual farm households' poverty.

of being food insecure if they rely on maize farming as a livelihood option (see last quotation below). This view deters many households from taking advantage of the opportunities provided by the liberalized maize market. Rather than respondents thinking how best to raise their yields to cater for their households' needs and the market, their main concern was their subsistence. It's argued that both the 'pessimistic' and the 'optimistic' respondents implicitly or explicitly agree that maize production has the potential to reduce poverty or improve rural well-being in Rukwa. Furthermore, some issues raised by the pessimistic group are the same as those of the optimistic group. For example both urge adoption of improved technologies and a close monitoring of input and output markets by the government. The following quotations, to support the above:

> "No, maize farming is not sufficient for the reduction of one's poverty. My experience for the past ten years shows me it's impossible unless changes happen."(A farmer in Sumbawanga district)
> "No, maize farming cannot help one reduce his/her poverty, particularly due to lack of needed inputs like fertilizers. People in our area are used to growing tobacco. Furthermore, even the fertilizer we apply to our maize is a result of tobacco farming." (An old male farmer in Mpanda district)
> "No, one crop for example maize alone is not adequate to reduce one's poverty, unless perhaps you mix with other crops like beans, sunflower, Irish[151] or sweet potatoes. Maize is mostly a food crop and we only sell a very small portion. If I were to totally rely on maize to meet all my needs, I would definitely be food insecure at a later stage." (A farmer in Nkansi district)

The above quotations are supported by observations from the FGDs and in-depth interviews with the concerned districts' agricultural officers (DAOs): although FGDs participants and DAOs believed maize farming is capable of improving rural well-being in Rukwa, they were cautious that current husbandry practices and lack of access to inputs were hindrances. The surveyed households' views are supported by Hazel et al. (2007) who have argued that small farms still remain the main ways through which poverty can be reduced in the developing world. However, for this to be possible they argue that improvements should be put in place with regard to input and output markets and the operation of financial services. Policy makers in Tanzania, agricultural extension staff, local authorities and the central government need to take the above observations onboard and see how best they could help rural households, particularly those who rely on maize farming as their main source of livelihood, to improve their well-being in line with the MDGs.

Many respondents think households could fight poverty or improve their well-being through maize farming, though not at current yield levels. Respondents' dismissal of maize farming for potential poverty reduction and well-being improvement is mainly because the crop is perceived as a food crop rather than a dual purpose crop with potential to meet not only households' food needs but also their cash needs. There is a

[151] In Tanzania this refers to white/round potatoes

strong possibility for maize to be a worthwhile cash crop if yield levels are raised, especially with the current rise in international prices of cereals/grain. Lastly, for the surveyed households and others in Tanzania to benefit from maize farming in a liberalized market, a change in mind set is needed; otherwise poverty levels may continue in the absence of suitable alternative opportunities. The quantitative analysis results show that relying too much on maize is associated with bad outcomes, but clearly the farmers think that given the right conditions maize is a way out of poverty. This may show why it was able to replace traditional staples such as millet and beans following its introduction in the 1970s (URT et al.., 2004).

Table 7.6: Respondents' opinions on maize farming's potential for poverty reduction in their area

Characteristic		Rukwa region n = 163	District		
			Sumbawanga n = 36	Mpanda n = 66	Nkansi n = 61
Can maize farming reduce poverty?	Yes	123(75.5)	32(88.9)	46(69.7)	45(73.8)
	No	40(24.5)	4(11.1)	20(30.3)	16(26.2)

Source: Own survey 2006, *NB*: Numbers in brackets indicate percentage

7.5 A comparison of household well-being between 2005 and 1986 for households in crop production in 1986

The main objective of the agricultural reforms carried out in Tanzania in the 1980s was to enable rural households to improve their well-being. Other socio-economic reforms were also introduced following the underperformance of Tanzania's approach to development using '*Ujamma na Kujitegemea*' (Socialism and self reliance) adopted by the government in 1967 through the Arusha Declaration. Despite the good intentions of the ideology, Tanzania went through severe economic crisis from the late 1970s onward and as a consequence availability of ordinary day-to-day necessities such as soap, cooking oil, sugar and many household goods items such as TV sets, radios, refrigerators, foam mattresses and many more were in short supply. Some day to day household necessities were mainly available in black markets at high prices. During that period ownership of things such as radios, televisions, a motorbikes and cars were seen as luxuries out of the reach of many. As a result Tanzania had to sign an agreement with the World Bank and the IMF in 1986 to adopt SAPs, and following this the government introduced programs including the Economic Recovery Programme One (ERP I) in 1986, ERP II, Economic and Social Action Plan (ESAP) and the Priority Social Action Plan (PSAP) in 1989 (Lugalla, 1997).

This section briefly examines the well-being of those households that were in maize production when the maize market was liberalized in 1986. The main aim of the examination is to see whether liberalization of the agricultural markets and the subsequent expansion of the market players enabled households reliant on maize as an income source to improve their well-being. The thesis does acknowledge the complexity of establishing the direct causal relationship between the liberalization of the maize and other markets and

households' well-being, due to the variety of other factors involved in the day-to-day living of rural households. This complexity is further compounded by the limitations associated with recall data. Therefore, observations from the study are not conclusive but suggestive as the study cannot really test if households are better-off or worse-off due to trade liberalization. However, the surveyed households' testimonies and observable indicators such as type of house owned, income and value of assets owned shed some light on the section's objective.

Generally, there has been an improvement in well-being over the time period 1986 and 2006 according to some of the well-being measures used by the study. Table 7.7 below shows an increase in number of households owning good houses from below five percent in 1986 to forty percent in 2006, and also that both annual income and households' asset value has increased[152]; whereas the increase in income is comparatively small the value of assets tripled.

Table 7.7: A comparison of real annual incomes, asset value and ownership of good quality house for households in maize production in 1986 and 2006

Characteristic		Year	
		1986	2006
Quality of house owned by surveyed household in 2006 (n = 85)	Good	2 (2.35)	34 (40)
	Poor	83 (97.65)	51 (60)
Average household income (Tsh)[153]		401,770.00	494,689.00
Average households asset value for 2006 (Tsh) (n = 87)		456,145.00	1,442,994.25

Source: Own survey 2006, NB: Numbers in brackets indicate percentage

Improvement in households' well-being is further supported by Table 7.8, which shows that more than half of the respondents had experienced an increase in household income and more than three quarters experienced an increase in their households' assets value between 1986 and 2006. According to the surveyed households' interview testimonies, these increases occurred as a result of factors such as increase in crop sales, maize included, and involvement in other income earning activities such as petty trade. However, a paired sample test (t-test) (Appendix 7.1) shows that the only significant difference was between the households' assets value in 2006 and 1986; this was significant at the 0.05 level. This observation suggests that households in maize production in 1986 were able to significantly increase their assets between 1986 and 2006. However caution needs to be used when interpreting the income and asset values because of recall problems. None the less households ability to increase their overall assets value was evident during the survey, some respondents reported they had used income from maize to buy farmland, build houses, buy livestock and many other things that added up to their total asset value. The

[152] Incomes and asset values reported for 1986 have been converted to 2005 and 2006 values to enable the comparison with 2005 and 2006 income and asset values respectively.
[153] Number of responses for 1986 and 2005 is 81 and 87 respectively.

observations suggest that many of the surveyed households were able to increase their household's asset value, partly due to the liberalized maize market which opened up the market to many buyers. Through competition they may have caused a rise in the price of farmers' maize, thereby raising their incomes. As observed in Chapter Six, most households sold their maize to other buyers apart from the Strategic Grain Reserve (a unit under MAFC) which is responsible for buying staples for storage for future release in case of food insecurity threats in Tanzania. Freeing the markets from the traditional monopoly of government parastatals also meant that farmers had an assured market and there was no possibility that they would be stuck with their produce; hence their income was assured for spending in the improvement of the household's well-being, including the asset build up as described in Table 7.8. It can be generally concluded from the above that many households in maize production in 1986, at the onset of the liberalization of the maize market, benefited in one way or the other from it.

Table 7.8: Income and assets value increase for households in maize production in 1986

Characteristic	Households income increase (n = 82)	Households asset value increase (n= 87)
Yes	48 (58.5)	69 (79.3)
No	34 (41.5)	18 (20.7)

Source: Own survey 2006, NB: Numbers in brackets indicate percentage

The other measures of well-being considered by the study were ability to afford health, education and social activities costs. Households surveyed seem to have only made improvement in the last category but not the other two (Table 7.9). With the exception of ability to afford social activities households thought they were more able to afford their health and education costs in 1986 than 2006. The reduced ability to meet health costs is not surprising many households in Tanzania were reporting hardships in meeting their health costs following the introduction of cost sharing brought in by the government's reform of the sector. The diminished ability to meet education costs is more surprising given that Table 7.1 has shown most respondents thought they were capable of meeting the costs, and the government is subsidising primary school education. It is assumed that households are facing hardships in meeting other educational costs such as costs of uniforms and other items that the government does not provide. Another assumption is that some respondents may been considering secondary school education, where the level of government subsidy is lower; for pupils going to private schools the costs are much higher.

Table 7.9: A comparison of ability for households in maize production in 1986 and 2005 to afford their health, education and social activities costs

Characteristic	Ability to afford household costs in		
	Health (n = 84)	Education (n = 71)	Social services (n = 83)
Less ability in 2006 as compared to 1986	55 (65.5)	36 (50.7)	30 (36.1)
No change in ability between 1986 and 2006	2 (2.4)	1 (1.4)	8 (9.6)
More ability in 2006 as compared to 1986	27 (32.1)	34 (47.1)	45 (54.2)

Source: Survey data 2006, ***NB***: Numbers in brackets indicate percentage

7.6 Conclusions

The chapter began by comparing indicators of well-being across households and districts, then examined the role of maize in well-being, and in particular explored a number of hypotheses relating to commercialisation and diversification. The chapter also looked at changes in the context of 20 years of reform. The well-being of households in rural Rukwa was measured using six basic criteria: ability to meet health, education, and social costs, ownership of a good quality house, cash income, and assets. The capabilities to meet costs in education, health and social activities were assessed on the basis of the respondents' perception. The relationship was examined between a household's well-being and maize production, based on percentage of land allocated to maize farming and the percentage contribution of income from maize sales to a household's cash income in 2005. The chapter also examined opinions by respondents as to whether maize production could be relied upon as an escape route out of poverty.

The chapter concludes that commercialization of agricultural production, both in terms of maize production and crop diversification, is vital for rural households' well-being for it enables households to produce more output in a more efficient way and earn more income which is vital for their well-being, be it meeting health or other needs. Observations from the study have shown that the more commercialized households were better were able to health and education costs. Commercialization of crop production was also associated with ownership of a good quality house and a higher mean asset value. The results are supported by Spring, 2000 and Hazel et al., 2007, who argue that commercialization of crop production is a good way of ensuring households' food security and general well-being.

It is also concluded that households diversification of their livelihood strategies was very important to their general well-being. Both quantitative analysis and summary statistics showed that such households did report higher cash incomes and ability to afford health and education costs. This does not necessarily imply causation but is suggestive of the importance of various livelihood strategies to a household's well-being. The observations seem to be in line with literature arguing that diversification of livelihood strategies is common amongst rural households, and is driven by many factors, such as low profitability of agriculture, as a way of meeting individual needs caused by low returns from commercial agriculture, the withdrawal of

the government from support programmes, risk reduction, responding to various constraints such as land fragmentation, and labour supply issues. Observations from the study (see Chapter Five) showed that households in Rukwa saw diversification as a way to improve their well-being.

The chapter further concludes that several household characteristics were associated with a household's well-being. However, some seemed to be associated with one measure but not the other. For example a household head's gender was significantly associated with a household's ability to meet its education needs; MHHs thought they were on average less able to meet their education costs relative to FHHs. On the other hand the likelihood of MHHs owning a good house in 2006 was higher than for FHHs. The observation that FHHs were less likely to own a good house may be because as reported in literature (FAO 2007 and Horrel, 2008), women's access to resources particularly in developing countries is limited. The differences in access to resources could also lead to adoption of different LS which may then affect inflows of cash income to the households and therefore their well-being. The present study has also shown that a households head's age was negatively and significantly associated with a household's capability of meeting their health and education costs, age was also negatively associated with a household's ability to afford social activities costs and ownership of a good house. This observation suggests that households headed by older heads may on average be poorer compared to those with younger heads. Farm size was also shown to be significantly associated with a household's well-being; households with larger farms were generally able to report higher mean cash income and assets value, afford social activities costs and own a good house.

Finally, some substantial gains were made by those households that were in maize production in 1986 when reforms in the agricultural sector were undertaken, including liberalization of the maize markets. The proportion owning good houses went up substantially and they also experienced increases in mean income and asset value. Though the increase in income is apparently small there was a tripling of the mean asset value. Due to data limitations the study is unable to show clearly how trade liberalization may have contributed to the above achievements. Nonetheless, before the 1980s reforms both the agricultural sector and availability of goods were seriously affected by the state's control of markets (Sijm, 1997 cited by URT *et al.*, 2000). According to Sijm availability of consumer goods is necessary to motivate farmers' production. Based on this point and observations from the study it may not be wrong to assume that liberalization of the agricultural and other markets have enabled the farmers to sell their surplus food crops and other cash crops, earning cash income with which to buy goods/assets that are readily available and increase their assets value.

Chapter Eight

Summary, conclusions and recommendations

This final chapter provides a summary, major conclusions and some broad policy recommendations as well as suggested areas needing further research. The thesis has mainly aimed at examining the role of maize in farmers' livelihoods and wellbeing in the context of a long period of reforms that have affected both the maize market, agriculture more generally and other aspects of people's lives such as health and education. The research examined diversification of rural livelihoods in Rukwa, households' crop production and how both were related to households' well-being. Specifically, it explored issues around maize and both on and off-farm diversification, commercialisation and well-being. A number of debates were explored around the importance of specialisation versus diversification both on and off-farm, the role of farm size in households' diversification of livelihood strategies (LS) and their well-being, farm households' access to agricultural inputs and extension services related to crop production. The thesis also examined how farmers' characteristics influenced households' LS, crop production and general well-being.

The study was prompted by the fact that production of staples occupies an important part in Sub-Saharan Africa's crop production, maize being the single most important food staple in the area (Byerlee and Heisey, 1996, URT, 2006). Apart from being a major source of households' food, maize is also a major source of cash income for many as it is a dual-purpose crop. Examining maize in the above context was seen as important to enable an understanding of its role in the livelihoods of rural households in Rukwa, a region known for its big maize harvests. The study was also inspired by the fact that commercialization of agricultural production reportedly capable of reducing households' poverty and enhancing their general well-being (Hazell, 2007). The need was identified to examine the extent to which rural households in Rukwa were commercialized with regards to maize production, and the relationship between their commercialisation, diversification and well-being.

In order to achieve its objectives the study employed a mixed method design in data collection. In addition to using a cross sectional research design, some secondary data from official sources were also used to enable exploration of changes over time. Agricultural sector data was collected from the three districts of Rukwa to ensure a diversified understanding of the phenomena under study in a range of localities. Collecting data from the three districts was essential as farmers in Sumbawanga and Nkansi are largely dependent on the maize crop as a major source of livelihood, whereas farmers in Mpanda apart from growing maize are also involved in tobacco farming. The study collected data using questionnaires, focus group discussions (FGDs) and in-depth interviews using pre-structured questionnaires. These were designed to enable collection of information on household characteristics, households' maize production levels, area under maize production, cash income from maize sales and its contribution to the households

income, production of other crops (and area used), and other sources of income of the household. Other information collected included households' access to markets (actual markets and market information) and information on the households' general crop husbandry. Apart from the primary data collected, the study used secondary data on production, input use (fertilizer and hybrid seeds) and marketing of maize, which was obtained from the Ministry of Agriculture, Food Security and Cooperatives and the Ministry of Commerce and Trade (Agricultural Marketing Bureau), Rukwa regional offices reports and other data sets (e.g. FAOSTAT).

Primary data collected by the study was analyzed using Statistical Package for Social Sciences (SPSS version 17); secondary data was analyzed using Excel. Correlation analysis of some variables was carried out to determine their association. Other analyses done included ANOVA and t-tests to check presence of variations between different groups/categories in relation to some variables. Data from the FGDs and in-depth interviews was mainly used to affirm the general information provided in the individual interviews. Chapter One developed some of the hypothesis and debates described above, Chapter Two reviewed the literature on wellbeing, livelihoods and crop production in Sub-Saharan Africa, and Chapter Three described the study area, the research design, types of data and methods used in data collection and limitations to the study. The chapter also presented the socio-economic characteristics of the households. Chapter Four gave an overview of Tanzania's agriculture.

Chapter Five examined the nature of both on-farm and off-farm diversification among farm households in an effort to establish the importance of staples such as maize to the farm and household LS, and how LS vary across key farm and household characteristics. The chapter defined diversification in a number of ways, including a simple count of the number of crops grown, or number of distinct activities, and the proportion of land used for different types of crops. A number of hypotheses were explored such as whether diversification represents a strategy enabling households to spread risk but preventing them from specializing in high risk but highly profitable activities; or whether the opposite is the case suggesting that diversification is associated with commercial operations.

Generally, it can be concluded that rural households in Rukwa adopted a diversity of livelihood strategies, and this finding concurs with literature reviewed earlier in the thesis which generally reports that most rural households diversify their livelihood strategies. Nonetheless, crop production is the main occupation for most households in Rukwa, and maize continues to play a significant role in their livelihoods. Maize was not only important to those households growing it for food and cash, but also to those with opportunities to grow traditional cash crops like tobacco as is the case for Mpanda. This observation is in line with what the DFID livelihood framework shows (Section 5.1); it puts food security among the major outcomes of households' choice of livelihood strategies.

It was concluded from Chapter Five that farm size was a major determinant of a household's crop diversification: those with more land, other things being equal, were able to grow more crops and allocated more land to cash crops as compared to those with less land. This observation supports the hypothesis that households with larger farms are more capable of diversifying by adopting new crops, than those with smaller farms. However, in the context of overall LS diversification those with smaller farms have on average adopted slightly more LS compared to those with larger farms, the variation being statistically insignificant. This finding leads to the assumption that households with a larger farm may have less time to work off-farm and so may have to grow more of their own food and generate an income by growing cash crops too. On the other hand households with smaller farms could be more vulnerable to agricultural shocks and in need of insurance based agricultural policies targeted at them. The study also found that maize yield levels tended to be higher among farmers that were less diversified in terms of livelihood strategies adopted. This does not necessarily imply causality but does suggest that while diversification may be an appropriate response to risk and vulnerability, it will not necessarily enable farmers to escape from poverty traps.

The study found that age was an important factor in both a household's diversification of crops grown and their LS. Results show that households headed by younger heads grew on average more crops than those headed by older heads; younger heads also allocated less land to maize production both as a proportion of their farm and as a proportion of land allocated to general food production. This observation is partly supported by Minot et al (2006) who argue that the experience accumulated by older heads over time could lead them to specialize in fewer crops. They add that older heads, due to greater experience and perhaps accumulation of assets, may tend to diversify into more remunerative non-farm activities while maintaining food production for their households' consumption. The younger heads in the study were also more diversified with regard to the number of LS adopted; some researchers (Smith et al, 2001 and Block and Webb, 2001) suggest that this may be because the younger heads are either more energetic less conservative and more open to trying new ventures, or driven to try them by the burden of supporting their children.

Chapter Six explored crop production and crop marketing by households in Rukwa in order to identify what factors were significantly associated with farm output, productivity and marketing of key crops. This goal was seen necessary to the study because raising outputs and productivity, alongside improving access to markets, are thought to be necessary for reduction of rural poverty (IFAD, 2001, World Bank, 2007). The chapter also investigated maize marketing by exploring marketing patterns, availability and type of buyers and whether the prices offered to maize producing households varied by type of buyer. These questions were particularly relevant in the context of 20 years or more of Tanzanian agricultural reforms, which were intended to stimulate access to inputs, improve market access and provide incentives to farmers to increase productivity. In addition to the emphasis placed on maize due to its importance to Rukwa

households' well-being, the chapter also examined production of five other crops: rice, beans, groundnuts, sunflower and tobacco.

Chapter Six has revealed that productivity of maize and the other crops mentioned above were relatively lower than levels reported in other parts of the developed the world and world in general, but broadly in line with official estimates for the region. This may have been due to a multitude of factors. For example examining maize production by households, which was the major emphasis of the study has provided some important revelations that could be of use to the other crops too. Field research showed that maize was observed in both discussions with farmers in the FGDs and the quantitative work based on survey data to be one of the most important crops for farmers; nevertheless there was a general consensus that farmers faced significant barriers in improving yields and output levels. Farmers reported, for example that accessing important inputs such as new seeds, fertilizers and extension services was difficult, either because these inputs were expensive, not available locally or not available altogether or because they felt their soil was fertile enough already and they distrusted modern inputs (i.e. sought no advice on fertilizer). However, the lack of statistical significance in the yields regression results of impacts of fertilizer, extension services advice and seeds suggests that a combination of factors is at work: simply using the inputs does not raise yields, as they need to be used in the right quantities, at the right time and in combination with other factors. In addition the data on fertilizer for example was not detailed enough to reveal whether farmers did use fertilizers in the right quantities, or the right types of fertilizer. The lack of statistical significance might be because so few used fertilizer that the regression cannot identify an effect.

The study also concludes from Chapter Six that households' heads' education level was relevant to the commercialization of staples production and that education level was positively related to higher maize yields. For example results from the regression suggest that households that sold maize rather than keep the whole harvest for home consumption had higher yields than those that did not. This in itself is an interesting result, suggesting that raising productivity is key to establishing well-functioning markets in key food staples, which Hazell et al. (2007) argues is a necessary step for food security. Furthermore the finding that education is positively related to both yields and commercialisation, suggest that improvements in education may also be a fruitful way of improving performance of the agricultural sector. Although this does not necessarily imply causation it does suggest the importance of education in boosting productivity in order for farmers to generate surplus output. Higher levels of education were also observed to be positively related to higher maize output. This finding indicates that if they have more education farmers can more easily overcome constraints of poor agricultural extension services and access to market information; they can more easily get information from printed media and other sources such as agricultural pamphlets, brochures and posters which are, or could be, locally available or obtained during agricultural shows (section 6.5).

Chapter Seven examined ways that commercialization of crop production by households especially that of maize was associated with their well-being. It also explored how households' diversification of their LS and the crops they grow was associated with their general well-being. The chapter pursued a number of hypotheses, one of which was to examine the role maize plays in well-being. Literature shows that commercialization of staples is a good way to assure households' food security and general well-being (Spring, 2000; Hazel et al., 2007 and WB, 2007). Diversification of livelihood strategies by households has been shown in previous chapters to be common amongst rural households.

The chapter has revealed that commercialization of agricultural production, both by maize production and crop diversification may be important for rural households' well-being as it enables households to produce higher output in a more efficient way, enabling them to earn more cash income which is important for their well-being, be it in meeting health or other needs. None the less, despite commercialisation being able to provide opportunities for farmers to increase their incomes and living standards, there is also the possibility that producers and consumers are likely to experience increased vulnerability to price fluctuations brought about by for example adverse weather, changes in input prices, and hence incomes and living standards. The present study showed that the more commercialized households were better-off in meeting their health and education costs. It also found that commercialization of crop production was associated with ownership of a good quality house and a higher mean asset value; this observation confirms previous research as pointed out above. It concluded that more diversified households were on average able to earn higher cash incomes and more able to afford health and education costs. This in itself does not necessarily imply causation, but is suggestive of the importance of a variety of LS to a household's well-being. The observations are generally in line with literature as discussed in previous chapters and the above findings on the importance of diversified LS to rural well-being.

The study further found that rural farm households in Rukwa were faced with various constraints that may have in one way or the other affected their crop productivity and consequently their well-being. Based on the respondents' own reports these include the failure to use modern or improved technologies in crop production. For example the study has shown that reliance on poor technologies such as the hand hoe, and inability to access inputs such as chemical fertilizers, pesticides and herbicides were mentioned to be major constraints. These constraints are supported by the quantitative analysis which showed that maize yields and outputs for households using oxen in preparing their farms were significantly higher than those reliant on the hand hoe. Other constraints were those related to weather (inadequate rain, winds, and floods), high weed intensity, vermin, theft and livestock invasion. The above constraints are similar to those reported for Rukwa and other parts of Tanzania in general, as pointed out earlier in Chapters Two, Four and Six, for example inability to use fertilizers (Skamstein, 2005), inability to use improved seeds (Dos et al., 2003), pests and diseases (URT, 2006) and harsh weather conditions (USAID-Tanzania, 2005 and MAFC, 2007). The study assumes that if these constraints were addressed many rural households in

Rukwa could further improve their well-being through increased crop yields and outputs hence more surplus in the case of staples or more crops in the case of cash crops to be sold in the markets. The above findings indicate that the only way to raise farmers' productivity is through participatory programmes in which policy makers, extension staff and farmers come together to address the current situation. This view is supported by Odame et al., (2003) who argue that inefficient extension services are a cause of low agricultural productivity and that it is only through the involvement of all stakeholders' farmers, extension staff, researchers, policy makers, input suppliers and output buyers, that agricultural productivity can be raised. It is also in line with recent discussions on the future of agricultural research held in Montpelier at the end of March 2010 that technology alone will not address the problems of agriculture in Africa (Metha et al., 2010)

Regarding to maize production, the study concludes that in addition to the proposal above, farm households, politicians and government officials may need to change the present mentality of viewing the crop mainly as a food crop, and the dual nature of the crop both as a food crop and a cash crop should be firmly embraced. Such a stance might improve farmers' production, their advice seeking behaviour and the ways extension services are offered in relation to the crop. It supports the view of Hazell et al. too who argue for commercialisation of food staples as a major step toward achieving food security. Furthermore, there is now an international rise in food prices due to food shortages, and the growing use of com/maize for animal feeds and the production of bio-fuels may cause supply to continue to fall short of demand,. This trend could cause further rises in price which could affect poor countries including Tanzania adversely. Therefore, a rise in maize productivity, while increasing farmers' incomes, could also ensure food security in the country.

Tanzania as a country is going to face increased demand for maize because her population is growing and she has fast-growing neighbours. Population projections show that Tanzania had a population of 37.9 million in 2006 and it is expected to reach 63.5 million in 2025 (URT, 2006). This may mean that Tanzania will require to fully utilize her food production potential from the land now under production and other arable land that is not currently in use. FAO (1993), cited by Ashimogo (1995) reports that Tanzania has 3.0 million ha of land suitable for maize production at a low level of input use, 6.0 million ha requiring an intermediate level of input use and 6.5 million ha requiring use of high input levels, and that in 1988/89 only approximately 2.0 million ha of this land were cultivated, producing about 2.5 million tonnes. In 2003 Tanzania's maize requirement stood at three million metric tonnes (RATES, 2003), and this has already risen due to population increase. Continued urbanization continues to pull energetic youth from rural to urban areas, leaving agricultural production mainly in the hands of the elderly and women, with this trend expected to increase in the near future. The maize requirement is expected to increase based on the current population growth rate of 2.9 for Tanzania mainland and 2.8 for the whole of Tanzania (URT, 2003). The urban population has also increased, by 5 percent, 13 percent, 21 percent and 27 percent in

1967, 1978, 1988 and 2002 respectively (URT/MPEE, 2006). At the current growth rate the urban population is projected to be 35.1 percent of the total population in 2025 and 54 in 2050 (UN, 2008). To feed the urban population, Tanzania will need to exploit maize production potentials to their fullest, as well as meeting the ever-increasing demand for maize for livestock feeds due to increased demand for livestock and poultry products by the growing middle class (USAID, 2005). If production is not increased situations of unrest in protest against soaring food prices, like those seen in some parts of the world in 2008, may become the norm in Tanzania.

To be able to meet her food needs Tanzania will need to harness the potential of her regions with greater agricultural potential such as Rukwa. First, the yield levels reported in Chapter Six will need to be raised through further commercialization by use of improved technologies such as chemical fertilizers, improved seeds and herbicides/pesticides. Secondly, Rukwa can expand its food production potential through expanded use of the arable land available, as currently only 21 % of this is being utilized for crop production (Box 5.2). Thirdly, recent developments show that despite the various constraints reported by the study the region has continued to maintain its position in the 'big four' and to be identified as one of the nine regions seen as Tanzania's "granaries", in a fresh bid to ensure food security by facing up to the challenges posed by the global food crisis (Guardian reporter, 25/07/2008). Rukwa's regional commissioner, Mr Njoolay, has been quoted as saying the region had produced over 1.6 million tonnes of various food crops in 2009 against the demand of over 500,000 tonnes required to feed its population of over 1.4 million. He added that the harvests meant a surplus of over 1.1 million tonnes of various crops in 2009 (Siyame, 2009; the Daily News, 10th October 2009). According to Siyame, Mr Njoolay further pointed out that the 2009 harvests were an increase of about 33 per cent from Rukwa's 2008 harvests and that the region expected to double its food surplus of different crops during the 2010 cropping season. FAO (2008) have pointed out that Rukwa along with Mtwara, Ruvuma, Kigoma and Mara are the five regions in Tanzania that are self-sufficient in relation to food crop supply. However, for Rukwa to realize its full potential there are some policy issues that need to be resolved, one of which is the restriction on staples traders are permitted to sell to neighbouring countries as was the case in early 2010. During this period there was a tug of war; crop traders wanted to be allowed to sell maize to neighbouring countries such as Congo, DRC, Malawi and Zambia, but the Ministry of Agriculture and Food Security was against the move (Nkolimwa, 2010)). As a result there was a likelihood that some local milling plants that had been operating in the region since 2007 could be forced to close down if export of maize flour continued to be banned (Siyame, 2010).

The need to exploit Tanzania's maize production potential also emanates from the fact that during years of bad harvest it is common for the government to ban the sale of crops outside Tanzania. This practice may be harmful to the farmers: in 2000/2001, when the country received adequate rainfall the resulting good harvests led the government to lift a ban on maize exports in response to high food demands in

neighbouring countries, and maize production rose by 22% in 2001. However, harvests in 2003 declined by about 10% due to low and erratic rainfall, leading to the re-imposition of the ban (except for Rukwa), and this increased the smuggling of maize across Tanzania's northern border (USAID-Tanzania, 2005). Again in 2006 a ban was imposed on the export of maize from Mbeya region due to drought conditions in some parts of Tanzania. The ban failed and over 320 tonnes of maize from Iringa and Mbeya regions worth 67.2m/- (Tsh), is thought to have been exported on a daily basis to Malawi and Zimbabwe through the Kasumulu border post in Kyela District (Kiduduye, (2006). In February 2008 the Tanzanian government once again threatened to punish maize exporters as some parts of the country were then facing food shortages (IPP Media/Regional reporter, 2008). It can be argued that rather than helping national food security, the imposition of export bans can worsen the situation, particularly as prices go up on the other side; due to the porous nature of our borders, smugglers end up benefiting even more compared with poor small-scale rural farmers. Perhaps it would be best to create an environment that is conducive to increased production that can fulfil internal requirements at all times, with the possibility of selling the surplus in a formal market. Tanzania could in the meantime meet her maize needs and even export by simply increasing productivity of the land currently allocated to maize, by use of modern technologies. This adjustment could also save the farmers the increased labour costs of expanding their farms.

The current study encountered a number of limitations both in the actual execution of the study and in availability of some secondary and primary data collected; some of the limitations are reported in Chapter Three. However, the major limitation to the study has been the difficulty of collecting recall data (see Chapter Three), one of which was the difficulty of remembering some important information after 20 years. For example during the interviews some farmers had clear memories about matter such as how much land they cultivated, but were less reliable on for example harvest sizes or prices received. Therefore, it has not been possible to investigate fully the nature of changes in farming over the 20 year reform period, and the results are suggestive but not conclusive. Other difficulties included getting detailed data related to total household income and the share of each LS or crop sold and income received. The lack of these details did hinder some further analyses for example determining changes over time, a more detailed analysis of income sources and a fuller price analysis. Despite the above limitations and those reported in Chapter Three, other literature has shown that in the absence of panel data as was the case with the current study, recall data could still shed some light on important issues.

The study has revealed some interesting information about rural livelihoods, crop production and rural well-being in Rukwa. Though the study has utilized secondary data covering Tanzania mainland as a whole with regard to maize production, productivity, land under maize cultivation and to some extent access to fertilizers and maize prices, and compared some of these with data from the primary field work in future, the primary data generated may not be representative of all rural areas of Tanzania that are

involved with maize farming. It is difficult or impossible to generalize the current study's observations, particularly because the study area chosen is a remote area with an underdeveloped infrastructure. However there are many parts of Tanzania and other Sub-Sahara African countries where these characteristics apply, so there may be some possibilities to generalise to other regions even though not to the country as a whole.

Rukwa's remoteness could cause high input costs and low maize prices that might affect the cash income of maize producing households causing it to vary from those in easily accessible areas. Therefore, implications of reforms in the agricultural sector such as liberalization of the maize market may vary in ways that cannot be quantified in accordance with a locality's remoteness and accessibility by buyers and input suppliers. The current study was also unable to isolate the effects of reforms of other sectors to rural households' well-being, making it impossible to clearly describe the positive and negative effects of those reforms on the surveyed households. It would be useful to develop data sets which are representative of all Tanzania's maize growing areas in order to test the robustness of the current study. These could then enable a closer examination of market transactions, technology adoption issues, and impact of the newly introduced subsidies (input purchase vouchers) through the Agriculture First Initiative ("*Kilimo Kwanza*") launched in 2009.

References

Abdulai, A. and CroleRees, A. (2001). Determinants of income diversification amongst rural households in Southern Mali. *Food Policy 26 (2001) 437–452*

Ahmed, I. and Lipton, M. (1997). *Impact of Structural Adjustment on Sustainable Rural Livelihoods: A Review of the Literature.* IDS Working Papers No. 62. Falmer, Brighton.

Alderman, H., and M. Garcia (1993). *Poverty, household food security, and nutrition in rural Pakistan.* Research Report 96, IFPRI, Washington, D.C.

Allen, D. J., Dessert, M. Trutmann, P and Voss, J. (1989). *Chapter 2: Common Beans in Africa and their constraints.* (In: Bean Production Problems in the Tropics.Ed Schwartz, H. F. and Pastor-Coralles, M. A.). CiAT (Centro International de Agricultura Tropical). Cali, Colombia, ISBN 958-9183-04-2

Alkire, S. and Deneulin, S. (2009). *The Human Development and Capability Approach: In An Introduction to the Human Development and Capability Approach Freedom and Agency.* Eds Séverine Deneulin and Lila Shahani. e-ISBN 978-1-55250-470-3 336 pp.

Altman, D. G., Zaccaro, D. J., Levine, D. W., Austin, D., Woodell, C. Bailey, B., Sligh, M., Cohn, G. and Dunn, J. (1998). Predictors of crop diversification: a survey of tobacco farmers in North Carolina (USA). *Tobacco Control; 7:376–382*

Anderson, Kym (2002). *Agricultural Trade Reform and Poverty Reduction in Developing Countries.* Discussion Paper No. 0234. University of Adelaide, Adelaide 5005 Australia

Ashimogo, G.C. (1995). *Peasant Grain Storage and Marketing in Tanzania: A case study of Maize in Sumbawanga* District. Verlag Dr. Köster, Berlin.

Ashimogo, G.C. (1997). Income Effects and Factors Affecting the Marketed Surplus of Maize: In Sumbawanga District, Tanzania. *Quarterly Journal of International Agriculture Vol.* 36 (4) pp 387 - 400

Ashimogo, G.C. and Mbiha, E. R. (2000). Changing Roles of the Government and Markets in Tanzania: Implementation, Impacts and Problems of a Liberalized Agricultural Marketing System. *In AGREST Conference Series* Volume 3 (1999). Agricultural Economics Society of Tanzania, August 2000.

Ashley, C. and Carney, D. (1999). *Sustainable Livelihoods: Lessons from Early Experience.* London, Department for International Development.

Ashley, C. and Maxwell, S. (eds.) (2001). Rethinking Rural Development. *Development Policy Review 19:4, December.*

Babatunde,, R. O. and Qaim, M. (2009). The role of off-farm income diversification in rural Nigeria: Driving forces and household access. Conference Paper presented on 23 Mar 2009 at the Centre for the Study of African Economies (CSAE), Economics Department, Oxford. http /conferences/2009-EDiA/papers/051-Babatunde.pdf-[28/02/10]

Babulo, B., Muys, B., Nega, F., Tollens, E., Nyssen, J., Deckers, J. and Mathijs, E. (2008). Household livelihood strategies and forest dependence in the highlands of Tigray, Northern Ethiopia. *Agricultural Systems 98 (2008) 147–155*

Balihuta, A. M. and Sen, K. (2001). *Macroeconomic Policies and Rural Livelihood Diversification: A Ugandan Case-study*. LADDER Working Paper No.3. www.foodnet.cgiar.org /SCRIP/docs&databases/ifpriStudies_UG.../pdfs/.../Rural%20livelihood%20diversification%20in%

Bank of Tanzania (BOT) (2005). Currency Exchange Rates. *Economic Bulletin for the Quarter Ending December, 2005 Vol. 37(4)*

Barrett, C. B., Reardon, T. and Webb, P. (2001). Non-farm Income Diversification and Household Livelihood Strategies in Rural Africa: Concepts, Dynamics, and Policy Implications. *Food Policy* Vol 26 (4), pp 315 – 331.

Berney, L. R. and Blane, D. B. (1997). Collecting Retrospective Data: Accuracy of Recall After 50 Years Judged Against Historical Records. *Social Science & Medicine, Volume 45, Issue 10, November 1997, Pages 1519-1525*

Bisanda, S., Mwangi, W., Verkuijl, H., Moshi, A.J. and Anandajayasekeram, P. (1998). *Adoption of Maize Production Technologies in the Southern Highlands of Tanzania.* Mexico, D.F.: International Maize and Wheat Improvement Center (CIMMYT), the United Republic of Tanzania, and the Southern Africa Centre for Cooperation in Agricultural Research (SACCAR).

Bitegeko, J. F. (2005). *Preface*: In Basic Data Agriculture and Livestock Sector 1995/96 – 2002/03. Statistics unit, Ministry of Agriculture and Food Security, February, 2005, Dar es Salaam.

Blarel, B., Hazell, P., Place, F., Quiggin, J., 1992. The economics of farm fragmentation: evidence from Ghana and Rwanda. *The World Bank Economic Review 6(2), 233-254.*

Block, S. and Webb, P. (2001). The dynamics of livelihood diversification in post-famine Ethiopia, *Food Policy* Vol 26 (4), pp 333-350.

Bookwalter, J. T. and Dalenberg, D. (2004). Subjective Well-Being and Household Factors in South Africa. *Social Indicators Research, Vol. 65 (3) pp. 333-353*

Brons, J. (2005). *Activity Diversification in Rural Livelihoods: The Role of Farm Supplementary Income in Burkina Faso*. Ph.D. thesis, Wageningen University

Bryceson, D. F. (2002). Multiplex Livelihoods in Africa: Recasting the Terms and Conditions of Gainful Employment. *Journal of Modern African Studies, Vol. 40 (1) pp 1-28.*

Bryceson, D. F. (1999). African Rural Labour, Income Diversification & Livelihood Approaches: A Long-term Development Perspective. *Review of African Political Economy No.80:171-189*

Bryceson, D.F. (1996). Deagrarianization and rural employment in sub-Saharan Africa: A sectoral perspective. *World Development 24 (1), pp. 97–111*

Byerlee, D. and Heisey, P. W. (1996). Past and potential impacts of maize research in sub-Saharan Africa: a critical assessment, *Food Policy* Vol 21 (3), *pp 255-277.*

Carswell, G. (2002). Livelihood Diversification: Increasing in importance or increasingly recognised? Evidence from Southern Ethiopia. *Journal of International Development, Vol. 14 (6) pp 789-804.*

Carswell, G. (2000). *Livelihood Diversification in Southern Ethiopia.* IDS Working Papers – 117. Falmer, Brighton ISBN 1 85864 310 4 40

Carter, M. R. (1984). Identification of the Inverse Relationship between Farm Size and Productivity: An Empirical Analysis of Peasant Agricultural Production: *Oxford Economic Papers, New Series, Vol. 36 (1), pp. 131-145 9*

Chambers, R. (1997) *Whose reality counts: Putting the first last* Intermediate Technology Publication, London. ISBN 185339386X

Chambers, R. and Conway, G. (1991). *Sustainable Rural Livelihoods: Practical Concepts for the 21st Century.* IDS Discussion Paper, no. 296. Falmer, Brighton.

Christiaensen, L. J. and Subbarao, K. (2005). Towards an Understanding of Household Vulnerability in Rural Kenya. *Journal of African Economies 14(4):520-*

Collier, P. (2008)."The Politics of Hunger: How Illusion and Greed Fan the Food Crisis." *Foreign Affairs Vol 87 (6)*

Cooksey, B. (2003). Marketing Reform? The Rise and Fall of Agricultural Liberalisation in Tanzania. *Development Policy Review*, 2003, 21 (1): pp 67-91

Crawford, E., Kelly, V., Jayne, T. S. and Howard, J. (2003). Input use and market development in Sub-Saharan Africa: an overview, *Food Policy,* Vol 28 (4), pp 277-292.

Creswell. J. W. (2003). *Research Design. Qualitative, Quantitative and Mixed Methods Approaches* (2nd Edition). Sage Publications London, New Delhi, Thousand Oaks.

Davis, B., Winters, P., Carletto, G., Covarrubias, K., Quinones, E. Zezza A., Stamoulis, K., Bonomi, G. and DiGiuseppe, S. (2007). *Rural Income Generating Activities: A Cross Country Comparison.* ESA Working Paper No. 07-16, Agricultural Development Economics Division, FAO. http://www.fao.org /es/esa/ [05/01/10]

Deere, C. D., & Doss, C. (2006). The gender asset gap: What do we know and why does it matter? *Feminist Economics, 12*(1-2), 1-50.

De Groote, H., Kimenju, S, Owuor, G. and Wanyama, J. (2006). *Market Liberalization and Agricultural Intensification in Kenya (1992-2002).* Contributed paper prepared for presentation at the 26th Conference of the International Association of Agricultural Economics, Gold Coast, Australia, August 2006. <http://ageconsearch.umn.edu/ handle/25419>-[3/11/2008]

De Weerdt, J. (2006). *Moving out of Poverty in Tanzania's Kagera Region.* Work done for the 'Moving out of Poverty' study at PREM, World Bank. http://siteresources.worldbank.org/INTMOVOUTPOV/ Resources/2104215-1187710751691/Tanzania_synthesis.pdf [20/04/09]

Deb, U. K., Rao, G.D. N., Rao, Y. M. and Slater, R. (2002). *Diversification and Livelihood Options: A Study of Two Villages in Andhra Pradesh, India 1975–2001.* Working Paper 178, December 2002.

Overseas Development Institute, London. http://www.odi.org.uk /Publications/working_papers/wp178.pdf-1/3/2007

Démurger, S., and Fournier, M. and Yang, W. (2009). *Rural households' decisions towards income diversification: Evidence from a township in northern China*. Documents De Travail - Working Papers. W.P. 09-23. ftp://ftp.gate.cnrs.fr/RePEc/2009/0923.pdf [28/02/10]

Dercon, S. (2005). *Vulnerability: a micro perspective*. www.economics.ox.ac.uk/members/stefan.dercon /vulnerability.pdf

Dercon, S. and Krishnan, P. (1996). Income Portfolios in Rural Ethiopia and Tanzania: Choices and Constraints. *Journal of Development Studies*, Vol. 32 (6), pp 850-75.

Dex, S., 1991. *The reliability of recall data: a literature review*. In: Occasional papers of the ESRC Research Centre on Micro-Social Change Working Paper 11, University of Essex, Colchester.

Diao, X. and Pratt, A. N. (2006). Growth options and poverty reduction in Ethiopia - An economy-wide model analysis, *Food Policy*, Volume 32, Issue 2, April 2007, Pages 205-228

Diskin, P. (1997). *Agricultural Productivity Indicators Measurement Guide*. Food and Nutrition Technical Assistance Project (FANTA), Washington, D.C.

Doss, C. R., Mwangi, W., Verkuijl, H. and de Groote, H. (2003). *Adoption of Maize and Wheat* Technologies in Eastern Africa: A Synthesis of the Findings of 22 Cae Studies. CIMMYT Economics Working Paper 03-06. Mexico, D. F.: CIMMYT. Http://www.syngentafoundation.org/pdf/P3_04_Doss_etal_2003_Adoption_in_East_Africa_CEP_ wp03_06.pdf-[5/10/2008]

DRG/WB, (2004). User's Guide to the Kagera Health and Development Survey Datasets. http://edi-europe.com/docs/khds/KHDS%20Users%20guide%20Dec%202004.pdf [06/04/10]

Dyer, Graham (1991) 'Farm size - farm productivity re-examined: Evidence from rural Egypt', *Journal of Peasant Studies, 19: 1, 59 — 92*

Duncan, G. and Hill, D. (1985) 'An investigation of the extent and consequences of measurement error in labour economic survey data', *Journal of Labour Economics*, 3, 508–32.

Echebiri, R. N. and Mbanasor, J. A. (2003). Rural Age Distribution and Farm Labour Supply in Food Crop Production Systems in Abia State, Nigeria. *Tropical and Subtropical Agroecosystems 2:129 – 136*

Ellis, F. (2005). Small Farms, Livelihood Diversification, and Rural-Urban Transitions: Strategic Issues in Sub-Saharan Africa. (International Food Policy Research Institute). 2005. *The future of small farms: Proceedings of a research workshop*, Wye, UK, June 26-29, 2005. Washington, DC.

Ellis, F. and Allison, E. (2004). *Livelihood diversification and natural resource access*. LSP Working Paper 9, FAO, Livelihood Support Programme (LSP).

Ellis, F. and Mdoe, N. (2003). Livelihoods and Rural Poverty Reduction in Tanzania. *World Development Vol. 31, No. 8, pp. 1367–1384*

Ellis, F. (2000). The Determinants of Rural Livelihood Diversification in Developing Countries. Oxford University Press- ISBN 0198296967(pbk.)

Ellis, F. (1999). Rural Livelihood Diversity in Developing Countries: Evidence and Policy Implications. *Natural Resources Perspectives Number 40.* http://www.odi.org.uk/resources/download/2112.pdf

Ellis, F. (1998). Household Strategies and Rural Livelihood Diversification. *The Journal of Development Studies, Vol. 35 No.1 pp 1-38.*

Ersado, L. (2003). *Income Diversification in Zimbabwe: Welfare Implications from Urban and Rural Areas.* Food Consumption and Nutrition Division (FCND), International Food Policy Research Institute (IFPRI), FCND Discussion Paper No. 152. http://www.ifpri.org /divs/fcnd/dp/papers/fcndp152.pdf-[8/11/2005]

Escobal, J. (2001). The Determinants of Non-farm Income Diversification in Rural Peru, *World Development*, Vol 29 (3*), pp 497-508.*

Evans, D. (2001). *Identifying Winners and Losers in Southern Africa from Globalization: Integrating findings from GTAP and Poverty Case Studies on Global Trade Policy Reform.* IDS Working Paper No. 140. Falmer, Brighton.

Fafchamps, M. (2003), '*Rural Poverty, Risk and Development*', Elgar Publishing, Cheltenham, UK and Massachusetts, USA ISBN 1843764369

Famine Early Warning Systems Network (FEWSNET) (2005). *Tanzania Food Security Update.* November 2005. http://www.sarpn.org.za/documents/d0001826/index.php[25/02/10]

Fan, S. and Chan-Kang, C. (2005). Is small beautiful? Farm size, productivity, and poverty in Asian agriculture. *Agricultural Economics, Vol. 32 s1), Pages 135 - 146*

FAO (2008). *Tanzania Nutrition Profile.* Nutrition and Consumer Protection Division, FAO, Rome. ftp://ftp.fao.org/ag/agn/nutrition/ncp/tza.pdf-[28/01/10]

FAO (2007). *Women and Land Tenure. FAO Focus.* FAO. <http://www.fao.org/ FOCUS/E/Women/ tenure-e.htm>-[8/12/2007]

FAO (2005).*The State of Food and Agriculture 2005: Agricultural Trade and Poverty Can Trade Work For the Poor*, Rome ISBN 92-5-1053449-9

FAO (2002). Land tenure and rural development. FAO Land Tenure Studies 3. Rome, 2002 ISBN 92-5-104846-0 http://www.fao.org/DOCREP/005/Y4307E/y4307e04.htm-[25/01/2010]

FAO. (1997).*Gender And Participation in Agricultural Development Planning: Lessons from Tanzania.* Dar es Salaam and Rome, November 1997. <http://www.fao.org/Gender /Static/CaseSt/Tan/ tan-e-6.htm (Annex 1-Tanzania Agriculture in Brief)>-[25/2/2007]

Freedman, D. *et al.* (1988) 'The life history calendar: A technique for collecting retrospective data' *Sociological Methodology*, 37–68

Galab, S., Fenn, B., Jones, N., Sree R. R., D., Wilson, I. and Gopinath R. M. (2006). *Livelihood Diversification in Rural Andhra Pradesh: Household asset portfolios and implications for poverty*

reduction. Young Lives Save the Children UK, London. <http://www. younglives.org.uk /pdf/WP34_Livelihood%20in%20AP.pdf>-3/10/2007

Gasper, D. (2007). *Conceptualising human needs and wellbeing*. (In: Wellbeing in Developing Countries: From Theory to Research. eds by Ian Gough and J. Allister McGregor). Cambridge University Press, ISBN-13: 9780511282850

Gemeda, A., Aboma, G. Verkuijl, H. and Mwangi, W. (2001). *Farmers' Maize Seed Systems in Western Oromia, Ethiopia*. Mexico, D.F.: International Maize and Wheat Improvement Center (CIMMYT) and Ethiopian Agricultural Research Organization (EARO). http://www. cimmyt.org/ Research/Economics/map/impact_studies/ImpStudEA_List/WOromiaEth.pdf-[1508/2007]

George, L. (2008). *JK Agiza Mkinga Kumiliki Maeneo ya Ujenzi wa Bandari. Nipashe Newspaper*, 24/7/2008. <http://www.ippmedia.com/ipp/nipashe/2008/07/24/119136.html>-[24/07/2008]

Gibson, J. and Kim, B. (2007). *Measurement Error in Long-term Retrospective Recall Surveys of Earnings*. Department of Economics, University of Waikato, Working Paper in Economics 3/07, Hamilton, New Zealand. ftp://mngt.waikato.ac.nz/RePEc/wai/econwp/0703.pdf [05/04/1999]

Gittinger, J. P., Chernick, S., Horenstein, N.R. and Saito, K. (1990). *Household Food Security and the Role of Women*. World Bank Discussion Papers, No 96. http://scholar.google.co.uk/scholar?hl=en&q=women%2C+food+crop+production%2C+and+food+security&btnG=Search-17/9/2009

Gladwin, C. H., Thomson, A. M., Peterson, J. S. and Anderson, A. S. (2001). Addressing food security in Africa via multiple livelihood strategies of women farmers, *Food Policy, Vol. 2 (2), pp 177-207*

Gough, I. McGregor, A. J. and Camfield, L. (2007). *Theorising wellbeing in international development*. (In: Wellbeing in Developing Countries: From Theory to Research. eds by Ian Gough and J. Allister McGregor). Cambridge University Press, ISBN-13: 9780511282850

Govereh, J. and Jayne, T.S. (1999). Effects of Cash Crop Production on Food Crop Productivity in Zimbabwe: Synergies or Trade-Offs? Department of Agricultural Economics: Department of Economics, MSU International Development Working Paper No. 74. Michigan State University http://ageconsearch.umn.edu/handle/11354 [3/9/2009]

Green, D. R., Owens, A., Maltby, J. and Rutterford, J. (2009). Lives in the balance? Gender, age and assets in late-nineteenth-century England and Wales *Continuity and Change 24 (2), 2009, 307–335.*

Grepperud, S., Wiig, H. and Aune, F. R (1999). *Maize Trade Liberalization vs. Fertilizer Subsidies in Tanzania: A CGE Model Analysis with Endogenous Soil Fertility*. Discussion Papers No. 249, February 1999 Statistics Norway, Research Department. <http://www.ssb.no/publikasjoner/ DP/pdf/dp249.pdf>

Guardian Reporter, Dodoma (2008). *Nine regions named as national granaries*. The Guardian Newspaper, 25/07/2008. http://www.ippmedia.com/ipp/guardian/2008/07/25/119194.html [25/7/2008]

Gunasena, H.P.M. (2001). *Intensification of Crop Diversification in the Asia-Pacific Region*. In: Crop Diversification in the Asia-Pacific Region, eds Papademetriou, M. K. and Dent, F. J.). RAP Publication: 2001/03, FAO, Regional Office for Asia and the Pacific, Bangkok.

Haan, L. de, and Zoomers, A. (2005). Exploring the Frontier of Livelihoods Research. *Development and Change* 36 (1) pp 27-47.

Hammond, R. (1997). *The Tobacco Industry Impacts on Tanzania*. Forum on Global Tobacco Control Policies, May 19th, 1997. <http://www.corpwatch.org/article.php?id=4028>-[8/10/2008]

Harrison, A. and Hanson, G. (1999). "Who Gains From Trade Reform? Some Remaining Puzzles," *Journal of Development Economics, Vol. 59 (1999*, pp 125–154.

Hazell, P., Poulton, C., Wiggins, S and Dorward, A (2007). *The Future of Small Farms for Poverty Reduction and Growth*. 2020 Discussion Paper No. 42. Washington, D.C.: International Food Policy Research Institute. http://www.ifpri.org/2020/dp/vp42.pdf [20/08/2007]

Hillocks, R.J., Madata, C.S., Chirwa, R., Minja, E.M. and Msolla, S. (2006). *Phaseolus* bean improvement in Tanzania, 1959–2005. Euphytica (2006). DOI: 10.1007/s10681-006-9112-9. cgiar.org [10/03/10]

Hooper, S., Martin, P., Love, G. and Fisher, B. S. (2002). Farm Size and Productivity: where are the trends taking us? *australiancommodities: Forecasts and Issues, Vol. 32 (3) pp 495 - 500*

Horrell, S. and Krishnan, P. (2007). 'Poverty and productivity in female-headed households in Zimbabwe', *Journal of Development Studies, 43: 8, 1351 — 1380*

Hussein, K. and Nelson, J. (1998). *Sustainable Livelihoods and Livelihood Diversification*. IDS Working Papers No. 69. Falmer, Brighton.

Hutton, G. (2002). *User fees and other determinants of health service utilisation in Africa: A review of formal and informal health sectors*. Study conducted under the SDC/STI Backstopping Mandate Final draft: 27th August 2002, Swiss Tropical Institute. <http://www.sdc-health. ch/priorities_in_health/pro_poor_health_service/ access_to_health_services/ user_fees_ and_other_determinants> [11/4/2007]

IFAD (2007). *United Republic of Tanzania: Country strategic opportunities programme*. EB 2007/91/R.14. http://www.ifad.org/gbdocs/eb/91/e/EB-2007-91-R-14.pdf [16/11/09]

IFAD (2001) *Rural Poverty Report: The Challenge of Ending Rural Poverty*: Summary. www.ifad.org [8/11/2005]

IFPRI (2002). *Ending Hunger in Africa: Only the Small farmer Can Do It*. IFPRI, Washington. <www.ifpri.org/pubs/ib/ib10.pdf>

Iiyama, M., Kariuki, K. Kristjanson, P., Kaitibie, S. and Maitama, J. (2008). Livelihood Diversification Strategies, Incomes and Soil Management Strategies: A Case Study from Kerio Valley, Kenya. *J. Int. Dev. 20, 380–397*

IMF Staff (2001). *Global Trade Liberalization and Developing Countries*. An IMF Issues Brief, IMF, New York. <http://.imf.org/external/np/exr/ib/2001/110801.htm>. [5/9/2004]

Immink, M.D.C. and Alarcón, J.A. (1992). Household food security and crop diversification among smallholder farmers in Guatemala Can maize and beans save the day? *Food, Nutrition and Agriculture, Issue Number: 4, FAO, Rome.*

IRRI (2007). Tanzania. http://www.irri.org/science/cnyinfo/tanzania.asp [1/11/09]

Issa, A. (2008). Tani 1000 za mahindi zakosa soko Ruvuma. *Alasiri, Newspaper*, 05/09/2008. http://ipp media.com/ipp/alasiri/2007/09/05/97802.html-5/9/2007

Iwanaga, M. (2001). Crop Diversification in Japan. In: Crop Diversification in the Asia-Pacific Region, eds Papademetriou, M. K. and Dent, F. J.). RAP Publication: 2001/03, FAO, Regional Office for Asia and the Pacific, Bangkok.

Jayawardane, S. S. B. D. G. and Weerasena, L. A. (2001). Crop Diversification in Sri Lank a. (In: Crop Diversification in the Asia-Pacific Region, Eds Papademetriou, M. K. and Dent, F. J.). RAP Publication: 2001/03, FAO, Regional Office for Asia and the Pacific, Bangkok.

Kabeer, N, Thi, Tand Anh V (2000). *Leaving the Rice Fields, But Not the Countryside: Gender, Livelihood Diversification and Pro-Poor Growth in Rural Viet Nam.* Occasional Paper 13, September 2000.<http://www.unrisd.org/ [30/4/2007]

Kadigi R. M. J., Kashaigili, J. J. and Mdoe, N. S. (2004). The economics of irrigated paddy in Usangu Basin in Tanzania: water utilization, productivity, income and livelihood implications. *Physics and Chemistry of the Earth 29 (2004) 1091–1100*

Kaija, D. (2007). Income Diversification and Inequality in Rural Uganda: The Role of Non-Farm Activities. A paper prepared for the Poverty reduction, Equity and Growth Network (PEGNeT) Conference, Berlin, September 6-7, 2007. http://www.ifw-kiel.de/konfer/pegnet07/kaija.pdf -4/10/2007

Kakwemire, N.D. K. and Mbiha, E. R. (1999). Economic Analysis of Cotton Marketing Practice after Trade Liberalization in Kahama District. In *AGREST Conference Series* Vol 3 (1999). Agricultural Economics Society of Tanzania.

Kaliba, A.R.M., H. Verkuijl, W. Mwangi, D.A. Byamungu, P. Anandajayasekeram, and A.J. Moshi. (1998). *Adoption of Maize Production Technologies in Western Tanzania.* International Maize and Wheat Improvement Center (CIMMYT), the United Republic of Tanzania, and the Southern Africa Center for Cooperation in Agricultural Research (SACCAR). <www. cimmyt.org/ research/economics/map/impact_studies/impstudea_list/WesternTnz.pdf>[7/12/2006]

Kaliba, Aloyce R M & Verkuijl, Hugo & Mwangi, Wilfred, (2000). Factors Affecting Adoption of Improved Maize Seeds and Use of Inorganic Fertilizer for Maize Production in the Intermediate and Lowland Zones of Tanzania. *Journal of Agricultural & Applied Economics*, Southern Agricultural Economics Association, vol. 32(1), pp 35-47

Kanji, N. and Barrientos, S. (2002). *Trade Liberalisation, Poverty and Livelihoods: Understanding the Linkages.* IDS Working Paper No. 159. Falmer, Brighton. The Institute.

Katinila, N., H. Verkuijl, W. Mwangi, P. Anandajayasekeram, and Moshi, A.J. (1998). *Adoption of Maize Production Technologies in Southern Tanzania.* Mexico, D.F.: International Maize and Wheat

Improvement Center (CIMMYT), the United Republic of Tanzania, and the Southern Africa Centre for Cooperation in Agricultural Research (SACCAR). <www. cimmyt.org/research /economics/map/impact_studies/impstudea_list/SouthernTnz.pdf > [7/12/2006]

Kejela Gemtessa, K., Bezabih Emana, B. and Tiki, W. (2006). *Livelihood Diversification in Borana Pastoral Communities of Ethiopia- Prospects and Challenges*. Conference Paper Presented at the Policy Research Conference on "Pastoralism and Poverty Reduction in East Africa," held in Nairobi, Kenya, June 27-28, 2006. SAGA Publications. http://www.saga.cornell.edu/saga /ilri0606/24gemtessa-emana-tiki.pdf-1/3/2007

Kessy, F., Mashindano, O., Rweyemamu, D. and Charle, P. (2006). *Moving Out of Poverty: Understanding Growth and Democracy from the Bottom Up. Regional Synthesis Report*. Final Draft, September, 2006.

Kherallah, M. and Govindan. K. (1999). The Sequencing of Agricultural Market Reforms in Malawi. *Journal of African Economies*, 1999, Vol. 8 (2), pp 125-51.

Kherallah, M., Delgado, C., Gabre-Madhin, E., Minot, N. and Johnson, M. (2000). *The Road Half Travelled: Agricultural Market Reform in Sub-Saharan Africa*. Food Policy Report, IFPRI, Washington, D.C. <http://www.ifpri.org/pubs/fpr/fpr10.pdf>[25/10/2008]

Kibaara, B. W. (2005). *Technical Efficiency in Kenyan's Maize Production: An Application of the Stochastic Frontier Approach*: Master of Science Thesis; Colorado State University Fort Collins, Colorado Summer 2005. <http://www.aec.msu.edu/fs2/kenya/o_papers /tech_eff_maize.pdf> [17/1/2008]

Kikwete, J. M. (2007). Address By His Excellency Jakaya Mrisho Kikwete, President of The United Republic of Tanzania, At the World Food Day, Rome, Italy, 16th October, 2007. <http://www.fao.org>

Kimati, 2009- (The Guardian Newspaper, 5th November 2009, http://www.ippmedia.com/[5/11/2009]

Kydd, J., Dorward, A., Morrison, J. and Cadisch, G. (2004). Agricultural development and pro-poor economic growth in sub-Saharan Africa: potential and policy, *Oxford Development Studies, 32: 1, 37 — 57*

Lanjouw, J. O. and Lanjouw, P. (2001). The rural non-farm sector: issues and evidence from developing countries. *Agricultural Economics 26 (2001) 1–23*

Larson, B. A. and Frisvold, G. B. (1996). Fertilizers to support agricultural development in sub-Saharan Africa: what is needed and why. *Food Policy*, Vol. 21 (6) pp 509-525.

Larson, D. F. and Leo´n, M. (2006). How Endowments, Accumulations, and Choice Determine the Geography of Agricultural Productivity in Ecuador. *The World Bank Economic Review, Vol. 20, NO. 3, pp. 449–471*

Lay, J., M'Mukaria, G. M. and Mahmoud, T. O. (2007). *Boda-bodas Rule: Non-agricultural Activities and Their Inequality Implications in Western Kenya*. GIGA (German Institute of Global and Area Studies) Research Programme: Transformation in the Process of Globalisation, Working Papers

No. 48, Hamburg, Germany. <http://www. duei.de/dlcounter/download.php?d=/content/ publikationen/pdf/wp48_lay-etal.pdf> [4/10/2007]

Luat, N. Van (2001). *Crop Diversification in Vietnam.* (In: Crop Diversification in the Asia-Pacific Region, eds Papademetriou, M. K. and Dent, F. J.). RAP Publication: 2001/03, FAO, Regional Office for Asia and the Pacific, Bangkok.

Lugalla, J. L. P. (1997). Economic Reforms and Health Conditions of the Urban Poor in Tanzania.

MAFC (2007). Some Crops Grown in Tanzania.<http://www.agriculture.go.tz/Agr-Industry/Crops-grown-tz.htm>[24/6/2007]

Mafuru, J., R. Kileo, H. Verkuijl, W. Mwangi, P. Anandajayasekeram, and A. Moshi. (1999). *Adoption of Maize Production Technologies in the Lake Zone of Tanzania.* Mexico, D.F.: International Maize and Wheat Improvement Center (CIMMYT), the United Republic of Tanzania, and the Southern Africa Centre for Cooperation in Agricultural Research (SACCAR).

Maghimbi, S. (2007). Recent Changes in Crop Patterns in Kilimanjaro Region of Tanzania: The Decline of Coffee and Rise of Maize and Rice. *African Study Monographs,* Suppl. 35, pp 73 – 83.

Mahesh, R. (2000). *Farm Size - Productivity Relationship: Some Evidence from Kerala.* KIED Working Paper 2, Kerala. http://maheshr.com/Publication/ FARM%20SIZE%20-%20PRODUCTIVITY (paper).pdf[1/4/10]

Makweta, J. (1993). *Preface*: In Basic Data Agriculture and Livestock Sector 1986/87 – 1991/92. Statistics unit, Planning and Marketing Division, Ministry of Agriculture, Tanzania, May, 1993.

Majid, N. 2004. "*Reaching Millennium Goals: How Well Does Agricultural Productivity Growth Reduce Poverty?*" Employment Strategy Paper 2004/12, International Labour Organization (ILO), Geneva

Majule, A. E. (2004). *Tanzania; Plant Nutrient Resources.* <http://www.fao.org/ ag/AGL /swlwpnr /reports/ y_sf/z_tz/tz.htm#plant>[6/3/2008]

Marzano, M. (2002). Rural Livelihoods in Sri Lanka: an Indication of Poverty? *Journal of International Development,* Vol 14 (6) special issue pp 817-828.

Masudi, A., Ishumi, A., Mbeo, F. and Sambo, W. (2001). *Tanzania Child Labour in Commercial Agriculture – Tobacco:*A Rapid Assessment. ILO, Geneva

Mathiowetz, N. A. and Duncan, G.J. (1988) 'Out of work, out on mind: response errors in retrospective reports of unemployment', *Journal of Business and Economic Statistics*, 6 (2), 221–29.

Meertens, B. (2000). Agricultural Performance in Tanzania Under Structural Adjustment Programs: Is it Really Possible? *Agriculture and Human Values* Vol. 17, pp 333 – 346.

Mengxiao, Z. (2001). *Crop Diversification in China.* In: Crop Diversification in the Asia-Pacific Region, eds Papademetriou, M. K. and Dent, F. J.). RAP Publication: 2001/03, FAO, Regional Office for Asia and the Pacific, Bangkok.

Mehta, S., Rupela, O., Bisht, S., Nayak, A. KJR and Narain G. H (2010). *Improving the Livelihoods of the Resource-Poor Smallholder Farmers and Producers in Developing Countries: An Urgent Appeal for Action*, Global Conference on Agricultural Research Development (GCARD), 4 March, 2010,

Montpelier, France. http://www.fao.org/docs/eims/upload/273459/White%20 Paper%205 Mar2k10.pdf [14/04/10]

Mhita, M.S (2006). *Climate Outlook for Tanzania for the Period January to March 2006.* <http://www.tanzania.go.tz/qlinksf.html> [5/3/2006]

Miller, R. (2007). *Using Family Histories to Understand the Intergenerational Transmission of Chronic Poverty.* Working Paper 103, Chronic Poverty Research Centre ISBN 978-1-906433-02-4

Minot, N., Epprecht, M., Anh, T. T. T. and Trung, Le Q. (2006). *Income Diversification and Poverty in the Northern Uplands of Vietnam.* Research Report No. 145.<http://www.ifpri.org/pubs/ abstract /145/rr145ch06.pdf> [9/12/2007]

Minot, N., 2003. *Income Diversification and poverty reduction in the northern uplands of Vietnam.* Paper presented at the Annual Meeting of the American Agricultural Economics Association, Montreal, Canada, 27-30 July.

Mose, L. O. (2007). *Who Gains, Who Loses? The Impact of Market Liberalisation on Rural Households in North-western Kenya.* PhD Thesis, Wageningen University. <http:// library.wur.nl/WebQuery/ catalog/lang/1835583 - 13k> [24/10/2008]

Mpagalile, J. J., Ishengoma, R. and Gillah, P. (2008). *Agribusiness Innovation in Six African Countries the Tanzanian Experience.* Report Prepared for the World Bank Institute, Morogoro, Tanzania.

Mwakalobo A.B.S. and Kashuliza, A.K. (1998). *Impact of Structural Adjustment Policies on Smallholder Farming Systems in Tanzania*: The Example of Mbeya region. In *AGREST Conference Series* Vol 2 (1998). Agricultural Economics Society of Tanzania, July 1999.

NBS, (2002). *Household Budget Survey* (HBS) 2000/01. NBS, Dar es Salaam.

NBS/MAFS/MWLD/MCM/PO/RALG/MFEA-Z (2006). *National Sample Census of Agriculture 2002/2003: Small-Holder Agriculture, Vol II Crop Sector-National Report*, Dar es Salaam

Niehof, A. (2004).The significance of diversification for rural livelihood systems. *Food Policy 29 (2004) 321–338*

Nkolimwa, D. (2010). Ban on export of food crops still on. The Guardian Newspaper,http://www. ippmedia.com/[01/03/2010]

Nkonya, E., Pender, J., Kaizzi, C., Edward, K. and Mugarura, S. (2005). *Policy Options for Increasing Crop Productivity and Reducing Soil Nutrient Depletion and Poverty in Uganda.* EPT Discussion Paper 134, IFPRI

Nkonya, E., Xavery, P., Akonaay, H., Mwangi, W., Anandajayasekeram, P., Verkuijl, H. Martella, D. and Moshi, A. (1998). *Adoption of Maize Production Technologies in Northern Tanzania.* Mexico D.F: International Maize and Wheat Improvement Center (CIMMYT), The United Republic of Tanzania, and the Southern African Center for Cooperation in Agricultural Research (SACCAR).<www. cimmyt.org/research/ economics/ map/impact_studies/ impstudea_list/NorthernTnz.pdf> [7/12/06]

Nwanze Okidegbe (2000). *Monitoring Rural Well-being: a Rural Score Card.* The International Bank for Reconstruction and Development? The World Bank, Washington, DC.

Odame, H. Kameri-Mbote, P. and Wafula, D. (2003). *Governing Modern Agricultural Biotechnology in Kenya: Implications for Food Security.* IDS Working Paper 199.Falmer, Brighton. The Institute. <http:// www.ids.ac.uk/ids/bookshop/wp/wp199.pdf>[29/11/2007]

OCOL (2007). *Glossary.* http://www.ocol-clo.gc.ca/html/stu_etu_052006_33_e.php[6/7/2008]

ODI (2002). *Rethinking Rural Development*: Briefing Paper March 2002. <www.odi.org.uk /events/FutureAgricultures_2005/Papers/Rethinking_Rural_DevelopmentBPNov2003.doc.pdf >

OECD (2001). Measuring Productivity: Measurement of Aggregate and Industry-Level Productivity Growth, OECD Manual, Paris, France.

Omiti, J., Otieno, D., Nyanamba, T. and McCullough, E. (2009). Factors influencing the intensity of market participation by smallholder farmers: A case study of rural and peri-urban areas of Kenya. *African Journal of Agricultural and Resource Economics Vol 3 No 1 pp 57 – 82*

OPM (Oxford Policy Management), (2004). *DFID Rural and Urban Development Case Study – Ethiopia.* http://www.passlivelihoods.org.uk/site_files%5Cfiles%5Creports%5Cproject_

Owens, T. Hoddinott, J. and Kinsey, B. (2003). The Impact of Agricultural Extension on Farm Production in Resettlement Areas of Zimbabwe. *Economic Development and Cultural Change*, Vol 51, pp 337–357.

Pender, J. and Gebremedhin, B. (2007). Determinants of Agricultural and Land Management Practices and Impacts on Crop Production and Household Income in the Highlands of Tigray, Ethiopia. *Journal of African Economies 17(3):395-450*

Pioneer (2006). *Kenya and Tanzania Urban Maize: Unlocking the Green Maize Market Potential in East Africa.*http://www.pioneer.com/web/site/portal/menuitem.9d2a5c9d507e4c719e0fc982d10 093a0/-[25/6/2007]

Pollard, Elizabeth L. and Lee. Patrice D. (2003). Child Well-Being: A Systematic Review of the Literature. *Social Indicators Research 6* 1 (1): 59–78, 2003.

Ponte, S. (2001). Trapped in Decline? Reassessing Agrarian Change and Economic Diversification on the Uluguru Mountains, Tanzania. *Journal of Modern African Studies, Vol. 39 (1) pp 81-100.*

Putterman, L. (1995). Economic Reform and Smallholder Agriculture in Tanzania: A Discussion of Recent Market Liberalization, Road Rehabilitation, and Technology Dissemination Efforts. *World Development,* Vol. 23 (2) pp 311- 326.

RATES (Regional Agricultural Trade Expansion Support Program) (2003). *Maize Market Assessment and Baseline Study for Tanzania.* <www.tradeafrica.biz/downloads /tanzania_report.pdf > [5/12/2005]

Reardon, T., Berdegué, J., Barrett, C. B. and Stamoulis, K. (2007). *Chapter 8: Household Income Diversification into Rural Nonfarm Activities.* Haggblade, S., P. Hazell, T. Reardon (eds.). 2007. *Transforming the Rural Nonfarm Economy: Opportunities and Threats in the Developing World,* Johns Hopkins University Press, ISBN-13:978-0-8018-8663-8

Reardon, T., Delgado, C. and Malton, P. (1992). Determinants and Effects of Income Diversification amongst Farm Households in Burkina Faso. *Journal of Development Studies, Vol. 28 (2), pp 264 – 296.*

RLDC (Rural Livelihood Development Company) (2008). *Minister of Industries, Marketing and Trade visits Dodoma sunflower processor.* http://www.rldc.co.tz/frontend/index.php?l=22&n=47[05/02/2010]

Rweyemamu, D. and Kimaro, M. (2006). *Assessing Market Distortions Affecting Poverty Reduction Efforts on Smallholder Tobacco Production in Tanzania.* Research on Poverty Alleviation (REPOA), Research Report 06.1. Mkuki na Nyota Publishers. <http://www. tanzania gateway.org/contents.asp?cpg=3&topicId=1>[8/10/2008]

SAA (Sasakawa African Association) (2007). *Country Profile.*<http://www.saa-tokyo.org/english/ country/cc_ tanzania.shtml> [24/6/2007]

Sahn, D. E. and Stifel, D. C. (2003). Urban–Rural Inequality in Living Standards in Africa. *Journal of African Economies 12: 564-597.*

Sahn, D. E., Younger, S. D. and Genicot, G. (2003). The Demand for Health Care Services in Rural Tanzania. *Oxford Bulletin of Economics and Statistics* 65 (2), pp 241–260.

SARDF (South African Rural Development Framework) (1997). http://cbdd.wsu.edu/kewlcontent/ cdoutput/TR501/page59.htm-[8/11/2005]

Satge, R. de (2002). *Learning About Livelihoods: Insights from Southern Africa.* Oxfam GB ISBN-10: 0855984686 http://www.oxfam.org.uk/resources/downloads/Learning%20About%20Livelihoods/learning_livelihoods_1.pdf

Satyasai, K. J. S. and Viswanathan, K. U. (1997). Commercialisation and Diversification of Indian Agriculture. Occasional Paper —5, National Bank for Agriculture and Rural Development Mumbai.

Schwarze, S. and Zeller, M. (2005). Income diversification of rural households in Central Sulawesi, Indonesia. *Quarterly Journal of International Agriculture 44 (2005), No. 1: 61-73.*

Scones, I. (1998). *Sustainable Rural Livelihoods: A Framework for Analysis.* IDS Working Paper No. 72. Falmer, Brighton.

Setboonsarng, S. (2005). Child Malnutrition as a Poverty Indicator: An Evaluation in the Context of Different Development Interventions in Indonesia. ADB Institute Discussion Paper No. 21. http://www.adbi.org /files/2005.01.14.dp21.malnutrition.poverty.indonesia.pdf-[15/1/2008]

Siyame, P. (2010). RC says no maize rotting in Rukwa. The Daily Newspaper, 12/03/2010. http://www.dailynews.co.tz/home/?n=8146&cat=home [12/03/10]

Skarstein, R. (2005). Economic Liberalization and Smallholder Productivity in Tanzania. From Promised Success to Real Failure, 1985-1998. *Journal of Agrarian Change*, 5(3) pp 334-362.

Smith, D. R., Gordon, R., Meadows, K. and Zwick, K. (2001). Livelihood Diversification in Uganda: patterns and Determinants of Change across Two Rural Districts. *Food Policy,* 26 pp 421 - 435

Smith, J., and Thomas, D. (2003) "Remembrances of things past: Test–retest reliability of retrospective migration histories." *Journal of the Royal Statistical Society: Series A (Statistics in Society), 166*(1), 23-49.

Spring, A. (2000). *Commercialization and Women Farmers: Old Paradigms and New Themes.* (In: Women Framers and Commercial Venture: Increasing Food Security in Developing Countries. Eds Spring, A.). Lynne Rienner Publishers Inc, Colorado (USA) and London (UK), ISBN 1-55587-869-5

Storm, S. (2005). Development, Trade or Aid, Growth and Poverty. *Development and Change*, 36 (6) pp 1239 -1261.

Galloway, S. (2006). Well-Being and Quality of Life: Measuring the Benefits of Culture and Sport: A Literature Review and Think piece. (In: Quality of Life and Well-Being: Measuring the Benefits of Culture and Sport: Scottish Executive Social Research 2005). http://www.scotland.gov.uk /Resource/Doc/89281/ 0021350.pdf[05/01/10]

Tauer, L. (1995). Age and Farmer Productivity. Review of Agricultural Economics, Vol. 17 (1), pp 63-69.

Temu, A. E. and Ashimogo, G.C. (1998). *Economic Reform in Tanzania: Impacts of Maize Production, Marketing, Prices and Food Security.* In *AGREST Conference Series* Vol. 1 Agricultural Economics Society of Tanzania.

Tenywa, M.M., Zake, J.Y.K., Sessanga, S., Majaliwa, J.G.M., Kawongolo, J. B. and Bwamiki, D. (2000). Changes In Water Infiltration Along A Catena Prior To Mechanised Clearing Operations and After Two Cropping Seasons. *African Crop Science Journal*, Vol. 8 (3), pp. 233-242.

Terme, R. A. I. (2002). *The Elimination of the Enrolment Fee for Primary Education in Tanzania: A Case Study on the Political Economy of Pro-Poor Policies.* Joint Donor Staff Training Activity, Module 1, Tanzania, June 17, 2002 Partnership for Poverty Reduction.

Thanh, H. X., Anh, D. N. and Tacoli, C (2005). *Livelihood Diversification and Rural-Urban Linkages in Vietnam's Red River Delta.* FCND Discussion Paper 193. <www.ifpri.org /divs/fcnd/dp/papers>

Thapa, S. (2007). *The relationship between farm size and productivity: empirical evidence from the Nepalese mid-hills.* CIFREM, Faculty of Economics, University of Trento, DECOS, University of Tuscia March 2007. Online at http://mpra.ub.uni-muenchen.de/7638/Munich Personal RePEc ArchiveMPRA Paper No. 7638, posted 11. March 2008 / 11:00[1/04/10]

The Village Land Act 1999. United Republic of Tanzania, Dar es Salaam.

Toulmin, C. Leonard, R. Brock, K. Coulbaily, N. Carswell, G. and Dea D. (2000). *Diversification of Livelihoods: Evidence from Mali and Ethiopia.* IDS Research Reports No. 47, Institute of Development Studies, University of Sussex, Falmer, Brighton.

Townsend, P. (2006). What is Poverty? An historical perspective International Poverty Centre. *Poverty In Focus* pp 5 -6

UN (2008). *World Urbanization Prospects: The 2007 Revision Population Database.* Population Division of the Department of Economic and Social Affairs of the United Nations Secretariat.<http://esa.un. org/unup/p2k0data.asp>[8/6/2008]

UNDP (2009). Human Development Report 2009: Overcoming barriers: Human mobility and development. United Nations Development Programme, New York. http://hdr.undp.org/en/reports/global /hdr2009 [23/03/10]

Unni, J. (1996). Diversification of Economic Activities and Non-Agricultural Employment in Rural Gujarat. *Economic and Political Weekly*, Vol. 31 (33), pp 2243-51.

URT (2008). *Agricultural Marketing Policy*. Ministry of Industry, Trade and Marketing, Dar es Salaam. <http:// www. mitm.go.tz/marketing.php?cat =14& subcat=32> [5/10/2008]

URT (2006). Basic Data Agriculture Sector 1998/99 - 2004/2005, Ministry of Agriculture and Food Security and Cooperatives, Dar es Salaam.

URT (2005). *Poverty and Human Development Report 2005.*

URT (2005: a). Basic Data Agriculture Sector 1995/96 - 2002/2003, Ministry of Agriculture and Food Security, Dar es Salaam.

URT/NBS/RRCO (2004). *Rukwa Region Socio-Economic Profile.*

URT (2003). *Rural Development Policy*. President's office. Regional Administration and Local Government. Government Printer, Dar es Salaam.

URT (2002). *Population and Housing Census*. http://www.tanzania.go.tz/census/arusha.htm. [12/10/2004]

URT (2001). Basic Data Agriculture Sector 1993/94 -1999/2000, Ministry of Agriculture and Food Security, Dar es Salaam.

URT (1997). *National Land Policy* (2nd ed). Ministry of Lands and Human Settlements Development, Dar es Salaam. <http://www.hakikazi.org/policies.htm>[8/11/2008]

URT (1993). Basic Data Agriculture and Livestock Sector 1986/87 -1991/92, Ministry of Agriculture, Dar es Salaam.

URT (1991). The Food Security Act, 1991. Acts Supplement. *The Gazette of the United Republic of Tanzania No.33 Vol.72, 16th August 1991*. Government Printer, Dar es Salaam.

URT (1987). Basic Data Agriculture and Livestock Sector 1983/84 -1987/88, Ministry of Agriculture and Livestock Development, Dar es Salaam.

URT and World Bank (2001). *Tanzania at the Turn of the Century: From Reforms to Sustained Growth and Poverty Reduction*. The World Bank, Washington D.C. and Vice President's office, Dar es Salaam.

URT, WB and IFPRI (2000). *Agriculture in Tanzania Since 1986 Follower or Leader of Growth? A World Bank Country Study*. The World Bank, Washington D.C.

URT/MPEE (2006). National Population Policy.<http://www.tanzania.go.tz/pdf/ldadi% 20Eng. Pdf > [7/6/2008]

URT/PMO (2001). *Rural Development Strategy*. Main Report Final. <http://www.bot-tz.org/MFI/Library/ruraldevelopmentstrategy1.pdf>[08/11/2005]

URT/RRAS/WB-Tanzania Country Office (2007). Growth Prospects for Rukwa Region: Constraints and Opportunities

URT/WB (Tz country Office) (2007).*Growth Prospects for Rukwa Region: Constraints and Opportunities.* http://www-wds.worldbank.org/external/default/WDSContentServer /WDSP/IB/2008/

USAID-Tanzania (2005). *Agricultural Sector Assessment.* <http://tanzania.usaid.gov/

USDA (2005). *Measuring Rurality: What is Rural?* Economic Research Service (ERS.USDA). http://www.ers.usda.gov/Briefing/Rurality/ WhatisRural/-8/11/2005

Van Dusen, M. Eric and Taylor, J. E. (2005). Missing markets and crop diversity: evidence from Mexico, *Environment and Development Economics, Vol. 10(4) pp 513-531*

Vittersø, J. (2004). Subjective Well-Being *Versus* Self-Actualization: Using the Flow-Simplex to Promote a Conceptual Clarification of Subjective Quality of Life. *Social Indicators Research* 65: 299–331

Warren, P. (2002). *Livelihoods Diversification and Enterprise Development: An Initial Exploration of Concepts and Issues.* Food and Agriculture Organization of the United Nations Livelihood Support Programme (LSP). LSP Working Paper 4. <ftp://ftp.fao.org/docrep /fao/008/j2816e/ j2816e00.pdf>[21/10/2007]

WB (2007). *World Development Report (WDR).Agriculture and Development.* The World Bank, Washington DC ISBN: 978-0-8213-7297-5

WB (2007: a). *Project Performance Assessment Report and Sector Overview United Republic of Tanzania: Agricultural Sector Management Project (Credit 2537), Second Agricultural Research Project* (Credit 3036), *National Agricultural Extension Project I1 (Credit 2899) June 18, 2007.* Report No. 401 09 – TZ. The World Bank.<http://lnweb90.worldbank.org /oedoeddoclib.nsf /ocUNIDViewForJavaSearch BC5A432C5B47EE6585257316007AC323$file/ppar_40109.pdf.>

WeD (2008). Social Policy for Sustainable Well-Being. Briefing Paper 4/08. www.welldev.org.uk [15/11/2009]

Wedgwood, R. (2007). Education and Poverty Reduction in Tanzania. *International Journal of Educational Development,* Vol 27, pp 383 – 396.

Wiebe, K. (2003). *Linking Land Quality, Agricultural Productivity, and Food Security.* Resource Economics Division, Economic Research Service, U.S. Department of Agriculture. Agricultural Economic Report No. 823.Washington, DC

Wiggins, S. (2009). *Can the smallholder model deliver poverty reduction and food security for a rapidly growing population in Africa?* FAC Working Paper No. 08 July 2009, Future Agricultures, Brighton.

Winters, A. L., McCulloch, N. and McKay, A. (2002). *Trade Liberalisation and Poverty: The Empirical Evidence.* Discussion Papers in Economics, University of Sussex, Discussion Paper 88.

Winters, L. A., McCulloch, N. and McKay, A. (2004). Trade Liberalization and Poverty: The Evidence so Far. *Journal of Economic Literature,* Vol. 42 (1), pp. 72-115.

Winters, P., Corral, L. and Gordillo, G. (2001). *Rural Livelihood Strategies and Social Capital in Latin America: Implications for Rural Development Projects.* Working Paper Series in Agricultural and Resource Economics No. 2001-6, University of New England. <http://www.une.edu.au/ febl/ EconStud/wps.htm>[8/11/2005]

World Bank (2000). *Agriculture in Tanzania since 1986 – Follower or leader in growth*? World Bank Report No. 20639. The World Bank, Washington DC.

World Geography of the Peanut (WGoP), (2003). http://www.lanra.uga.edu/peanut/knowledgebase/countries/tanzania.cfm[01/11/09]

Appendices

Appendix 3.0: Rukwa's agro-ecological/economic zones

Agro-ecological zone	Ecological characteristics	Economic/Agricultural potentials/characteristics
Ufipa Plateau	-500-2200 m.a.s.l , -almost deforested plateau with open grassland vegetation -Isolated hill, and ranges -soils are predominantly leached, acidic and ferralitic with loamy or sandy top soils becoming more clayey by depth, -densely populated	-Cattle keeping common for cash, meat and as a source of draught power -Important for maize growing -other traditional crops are finger millet and beans -Fallowing and rotational cropping widely practiced
Rukwa Valley	--800-1000 m.a.s.l , -partly consists of Acacia woodland with areas of grassland vegetation -alluvial soils, predominantly sandy with high fertility levels -poorly drained cracking clays and saline soils also present in some areas -Area densely(medium) populated	-Grazing value high hence the presence of high wildlife numbers -Has potential for both rain fed and irrigated farming, -major crops maize and rice -Receives erratic rainfall ranging between 700 to 1000 mm per annum -main economic activities include crop production, cattle keeping and fishing
Lake Tanganyika Shore and escarpment	-Lake shores 700 m.a.s.l , -Alluvial soils with sandy soils also being common -Soil erosion serious due to deforestation -Vegetation mainly Miombo woodland -Rainfall ranges between 900–1000 mm p.a. -Less densely populated	- Main crops, cassava, rice, millet and beans - Fishing is an important source of income and food
Katumba-Inyonga plain	--1000-1200 m.a.s.l, -Tsetse infested Miombo woodland -Sandy soils with very low fertility -Rainfall ranges between 900– 000 mm p.a. and -Sparsely populated	-Important crops cassava, maize and groundnuts -Beekeeping and lumbering of hard wood are also important economic activities
Mpanda –Mwese dissected plateau	--1000-1200 m.a.s.l, -Hill ranges and minor plateau area -Miombo woodland -Loamy and ferralitic soils -Largely sparsely populated	- Suitable for cereals (maize and finger millet), beans , cassava, sweet potatoes and rice -Groundnuts, sunflower, tobacco the major cash crops -livestock restricted to tsetse free areas -Use of oxen quite common -Beekeeping also a major economic activity

NB; Information in this Table comes mainly from pages 39 -41 of Rukwa's 2004 Socio-Economic Profile (URT ET AL., 2004)

Appendix 3.1: Tanzania's 2002/03 Agriculture Census Sample Design

Level	Tanzania mainland	Zanzibar	Total
Households	48,315	4,755	53,070
Village/Enumeration areas (Eas)	3,221	317	3,539
Districts	117	9	126
Regions	21	5	26

Appendix 3.2: Villages and Number of Households Involved in the Study on Maize Market Liberalization and Poverty Reduction; A Case Study of Rukwa Region, Tanzania

District	Division	Name of village	Number of respondents
Sumbawanga	Mpui	Sandulula	22
	Mtowisa	Kalumbeleza	6
		Muze	10
	Mwambi	Ninga	19
	Kasanga	Muzi	15
	Mpui	Sandulula(FGDs)	26[a]
		Total	**98**
Mpanda	Karema	Kapalamsenga	20
	Kabugu	Igagala	11
		Ifukutwa	10
	Mpibwe	Kibaoni	11
	Nsimbo	Mtapenda	15
	Kabungu	Ifukutwa (FGDs)	27[b]
	Mpibwe	Kibaoni (FGDs)	28[c]
		Total	**122**
Nkansi	Namanyere	Kanazi	12
		Ntumbila	3
	Chala	Londokazi	16
	Kirando	Katongolo	16
	Kate	Nkundi	15
	Chala	Londokazi (FGDs)	26[d]
		Total	**87**
		Grand Total	**307**

NB: [a] this comprised of 12 females (six aged below 35 years and six above) and 14 males(7 aged below 35 years and 7 above),
[b] This comprised of 14 females (9 aged below 35 years and 5 above) and 13 males (7 aged below 35 years and 6 above),
[c] This comprised of 14 females (7 aged below 35 years and 7 above) and 14 males (8 aged below 35 years and 6 above) and
[d] This comprised of 13 females (7 aged below 35 years and 6 above) and 13 males (7 aged below 35 years and 7 above)

Appendix 3.3: Questionnaire Used in the Research on Maize Market Liberalization and Poverty Reduction in Rural Areas: A Case Study of Rukwa Region, Tanzania

The research you are about to participate in is for a DPhil research for A DPhil (Development Studies) student at the University of Sussex, in the United Kingdom and will be used in writing a DPhil thesis.

1. **HOUSEHOLD IDENTIFICATION**

Name of respondent.....

Name of household head.....

Education level of respondent.....

District.....

Division.....

Ward.....

Village.....

Date of interview.....

Name of interviewer.....

2. **HOUSEHOLD BACKGROUND VARIABLES**

a) Household Composition

Table 1: Household composition

S/No	Member	Sex	Age	Relationship to Household head	Highest level of formal education	Main occupation	% contribution of main occupation to household income
1							
2							
3							
4							
5							
6							
7							
8							
9							
10							

b) For how long have you lived in this village..... (years)

c) Are you a native/were you born in this place Yes/No

If not when did you move to this place?.....

What prompted you to come to this place?.....

.....

3. **INFORMATION ON CROP PRODUCTION AND RESPONDENTS' OTHER SOURCES OF INCOME**

a) How much land do you own.....acres?

Is all the land you own on one plot Yes/No?

If no how many plots do you own.....

Show their sizes in the Table below;

Table 2: Household's Land Plot Sizes

Land Owned	Plot 1	Plot 2	Plot 3	Plot 4	Plot 5
Plot Size					
Distance from home to plot					

Do you rent any land for your crop production Yes/No?

If yes how many acres.....

b) Types of crops grown and allocated area for 1986/year you started farming maize (indicate..... .....) and 2005 (fill in Table 3)

Table 3: Crops Grown and their Area

S/No	Crop Type	Area (acres) under crop in 1986/ year you started farming maize (indicate year.....)	Area (acres) under crop in 2005
1	Maize		
2	Tobacco		
3	Finger Millet		
4	Others (specify)		
5			
6			
7			
8			

c) **What are your other sources of income?**

Table 4: Respondents Other Sources of Income and their Proportion Contribution to the Household's Income

S/No.	Source of Income	Percentage contribution to household Income
1.	Livestock Keeping	
2.	Off-farm casual labour	
3.	Paid Employment	
4.	Remittances (from relatives/children)	
5.	Trade	
6.	Others (Specify).....	

4. Information on Land preparation for crops grown by farmer

a) What method of tillage do you use in preparing your crop land for planting/sowing?

i) Plough using a tractor

ii) Plough using ox-plough

iii) Zero tillage

iii) Use a hand hoe

iv) Other (specify) _____

b) If tractor used

i) Is it hired? ii) Owned by respondent iii) Other (specify).....

c) If ox-plough is used

i) Is it hired? ii) Owned by respondent iii) Other (specify).....

d) What are the costs per hectare for land tillage using

i) A tractor _____

ii) An ox-plough _____

iii) Manual labour using the hand hoe _____

5. Source of Labour for Crop Production (fill in Table 5)

Table 5: Source of Labour for Crop Production

S/No	Crop type	All family	All hired	About equal family and hired	Mostly family	Mostly hired
1	**Maize**					
	Ploughing/tillage					
	Planting					
	Weeding					

	Fertilizer Application					
	Harvesting					
	Loading/Transportation					
2	**Tobacco**					
	Ploughing/tillage					
	Planting					
	Weeding					
	Fertilizer Application					
	Harvesting					
	Loading/Transportation					
3	**Finger Millet**					
	Ploughing/tillage					
	Planting					
	Weeding					
	Fertilizer Application					
	Harvesting					
	Loading/Transportation					
4	**Others (specify)**					
	Ploughing/tillage					
	Planting					
	Weeding					
	Fertilizer Application					
	Harvesting					
	Loading/Transportation					

6) Use of Inputs on Maize production

a) What type of seeds do you use in producing your maize?

1) Traditional/Local Seeds 2) Hybrid Seeds (bought from input shops every year)

3. Seeds from previous harvest (from hybrid Seeds) 4. Others (specify).....

b) Do you apply fertilizers to your maize Yes/No?

If yes what type 1. Industrial ( ) 2. Farm yard manure ( ) 3. Other (specify).....( )

If industrial fertilizer is used, what types and amounts are used (fill in the Table 5)

If no why?.....

Table 6: Types and Amount of Fertilizer used on Maize

S/No	Type of Fertilizer used	Amount used (kg) per hectare
1		
2		
3		
4		

7) Crop production and sales for 1986 and 2005

a) Do you sell any of the crops you produce Maize Yes/No?

Others (indicate).....Yes/No

If yes indicate amount of crop sold to each of your buyer(s) in the table below;

Table 7a: Markets for Farmers Crops 1986/Year you started farming maize (indicate.....)

S/No	Farmer's market outlet	Amount of maize sold	Amount of tobacco sold	Amount of finger millet sold	Amount of other crop sold (specify)	Amount of other crop sold (specify)
1	Strategic Grain Reserve (SGR)					
2	Cooperative Society					
3	Small crop traders					
4	Big traders in the district					
5	Big traders from outside the district					
6	Local market					
7	Other(specify)					

Table 7b: Markets for Farmers Crops 2005

S/No	Farmer's market outlet	Amount of maize sold	Amount of tobacco sold	Amount of finger millet sold	Amount of other crop sold (specify)	Amount of other crop sold (specify)
1	Strategic Grain Reserve (SGR)					
2	Cooperative Society					
3	Small crop traders					
4	Big traders in the district					
5	Big traders from outside the district					
6	Local market					
7	Other(specify)					

b) How far is the market where you sale your maize?

1) Less than 1 Km 2) 2-5 Km 3) 6-10 Km 4) More than 10 Km

c) How do you get information on the price of maize?

1) From friends 2) From buyers 3) From media 4) Others (specify).....

d) How much of the following crops did you produce and sale in 1986/year you started farming maize (indicate..... .....) and 2005?

Table 8: Proportion of Crop sold by Farmers

S/No	Crop Type	Amount Produced (Kg) 1986/year you started farming maize (Indicate.....)	Amount Sold (kg) 1986/year you started farming maize (Indicate.....)	Amount Produced (Kg) 2005	Amount Sold (kg) 2005
1	Maize				
2	Tobacco				
3	Finger Millet				
4	Other (specify)				
5					
6					
7					
8					

e) What was the price of maize in 1986/year you started farming maize (indicate year.....) .....(Tsh)

f) What was the price of Maize in 2005?..... (Tsh)

8) Information on Crop Ownership (fill in Table 9)

In your household who controls income earned from selling crops farmed by the household (fill in Table 9)

Table 9: Crop ownership by sex

S/No	Crop Type	Husband	Wife	Both Husband and wife	Others(specify)
1	Maize				
2	Tobacco				
3	Finger Millet				
4	Others (specify)				
5					
6					
7					
8					

9. Use of Agricultural Extension Services

a) Do you seek agricultural advice Yes/No?

If yes from whom 1. Village/Ward/Division Agricultural Extension Officer

2. Neighbours/Friends

3. Others (specify).....

If no why.....

10. Household Expenditure of Income Earned From Maize Sales

a) On what items do you normally spend money earned from selling maize?

i) Buying food

ii) Buying clothes

iii) Paying school fees

iv) Buying exercise books and reference books for children

v) House construction

vi) Buying land

vii) Starting small business

viii) Others (specify).....

b) Has your share of household income from maize sales increased after 1986 or since you started producing maize (indicate year) Yes/No?

If Yes by how much %?.....

If No why?.....

c) Has your household expenditure from money earned from maize sales increased after 1986 or since you started producing maize (indicate year) Yes/No?

If Yes by how much %?.....

If No why?.....

11. What is your general view of maize production in your area?

.....

.....

.....

12. Based on your personal view indicate your reaction to the following statements by placing a tick in the corresponding box in Table 10.

Table 10: Respondents view on Liberalization of the Maize Market

	Strongly agree	Agree	Can't decide	Disagree	Strongly disagree
The government of was right in liberalizing the maize market					
The government should be responsible in the purchase of your maize					
The government should allow traders from outside Tanzania to come and buy your maize directly					
The government should set a price for your maize					
The government should regulate the buying of maize by private traders to ensure farmers get better prices					

13. What is your general view of maize marketing in your area?

.....

.....

14. What problems do you encounter in your maize production?

i.....

ii.....

iii.....

iv.....

v.....

15. **Information on Asset Ownership**

a) What assets did you own in 1986/when you started producing maize (Indicate Year.....) and in 2006?

Table 11a: Assets Owned in 1986 or When You Started Producing Maize (indicate year) .....

S/No	Asset	Value (Tshs)
	TOTAL	

Table 11b: Assets Owned In 2006 (Twenty Years After Maize Market Liberalization in Tanzania)

S/No	Asset	Value (Tshs)

	TOTAL	

16. **Information on Welfare Indicators**

a) Comparing now (2005/06) and 1986/ or since you started producing maize (indicate year.....), when has it been easier to meet your health services costs?
(2005/06) or 1986/ or since you started producing maize (indicate year.....)
Explain your answer.....

b) Comparing now (2005/06) and 1986/ or since you started producing maize (indicate year.....), when has it been easier to meet your educational costs for your family members?
(2005/06) or 1986/ or since you started producing maize (indicate year.....)
Explain your answer.....

c) What type of house do you live in now?

1) Burnt bricks with corrugated iron sheets
2) Burnt bricks with a thatch roof
3) Mud house wall (wooden poles) with corrugated iron sheets roof
4) Mud house with a thatch roof
5) Other (specify)_____

Table 12: Respondents' House Characteristics

Respondents' house Information	Type of House	Number of Rooms
In 1986/when the respondent first started to cultivate maize		
In year 2006		

d) Do you have a running water tap in your home/compound? Yes/No
If no why?.....

e) Are you able to participate in the various social activities (e.g. marriage ceremonies send off parties, First communion, Confirmation that require one to contribute some money in order to participate? Yes/No
Explain your answer.....

17. What is your definition of a poor person?

.....

.....

18. What other economic activities would you consider to be the best ways for an individual in your area to escape from poverty or by which they could improve their lives?

a).....Reason.....

b).....Reason.....

c).....Reason.....

19. Are there any natives of your village you know that have moved out of your village permanently Yes/No
If yes why did they move out?.....

.....

20. Do you know of any individuals/households who are not native to this village that have moved in and settled permanently in your village? Yes/No

If yes what reasons do they offer for their moving into your village?.....

.....

.....

21 Other observations..... .....

.....

.....

.....

Thank you very much for your cooperation in this research

Appendix 3.4: Definitions of variables used in the study

Variable name	Detailed description
crop output	Refers to a household's total production of a particular crop measured in kg.
crop yield	Refers to a crops productivity measured as unit output per unit of land used (kg/ha)
Farm land owned	This refers to all land owned by a household
Farm size 1986/2005	This refers to the actual land being utilized by the household for crop production in the particular year.
Household	This refers to 'a group of persons who usually eat and share some common living arrangements; a similar approach was taken in the 2000/01 Tanzania Integrated Labour Force Survey.
Household income	The study only considers the actual cash inflows reported by households during the survey rather than income on basis of value of all goods/output and services. This is because the initial approach of the study did not require households to recall and to value goods and services they consumed through their own production, or received as payment in kind for services they provided.
Household assets value	Assets' value was solely determined by respondents own valuations as per their local market prices for each type and number of asset they owned; total asset value was calculated using these prices/valuations. The assets under consideration included anything the respondents thought was of value in their locality such as; land, houses, livestock, ox-ploughs, furniture, radios, sewing machines, carpentry tools, fishing boats and nets to mention a few. According to the Cambridge Advanced Leaner's Dictionary (2005:66) one of the definitions of asset is "something valuable belonging to a person or organization which can be used for the payment of debts". A further elaboration shows that assets can further be categorized into liquid assets (i.e. money or things that can easily be changed into money) and liabilities (i.e. specialized debts). The thesis considered only the first category.
Household size	This refers to the number of individual s in a household
Household heads education	This refers to the number of years of formal education (primary school leaver =7, secondary =11, high school =13 etc)
Household heads gender	This refers to whether a head of household was a male or female
Good quality houses	These are houses with walls made of either baked/burnt bricks or concrete blocks with roofs of galvanized or corrugated metal sheets.

Appendix 3.5(A translated version Appendix 3.2): Hojaji Itakayotumika Katika Utafiti wa Soko Huria la Mahindi na Upunguzaji Umaskini Katika Sehemu za Vijijini:Uchunguzi Kifani Mkoani Rukwa, Tanzania.

Utafiti ulio mbioni kuushiriki ni utafiti rasmi kwa ajili ya Shahada ya Juu (DPhil) kwa Mwanafunzi wa Shahada ya Udaktari wa Falsafa (Maendeleo ya Jamii) katika Chuo Kikuu cha Sussex, huko Uingereza, nao utatumika katika uandishi wa Tasnifu yake ya Shahada ya Juu (Dphil).

1. UTAMBULISHO WA KAYA

Jina la Mhojiwa: .....

Kiwango chake chajuu cha elimu.....

Jina la Mkuu wa Kaya: .....

Wilaya: .....

Tarafa:.....

Kijiji.....

Tarehe yaMahojiano:.....

Jina la Mhojaji:.....

2.SIFA ZA KAYA

Jedwali Na 1: Wanakaya Wanaounda Kaya Hiyo

Na.	Mwana-kaya	Jinsia	Umri	Uhusiana na Mkuu wa kaya	Kiwango chake cha juu cha elimu	Ajira yake kuu	Huchangia asilimia ngapi katika pato la
1							
2							
3							
4							
5							
6							
7							
8							
9							
10							

3. TAARIFA KUHUSU UZALISHAJI MAZAO

a) Je una miliki shamba la ukubwa gani? Ekari .....

Je mashamba unayomiliki yapo pamoja kwenye eneo moja? Ndiyo/Hapana

Kama sivyo, unayo mashamba madogo madogo mangapi? . Onyesha ukubwa wake katika jedwali linalofuata;

Jedwali Na. 2: Ukubwa wa Mashamba ya Kaya Husika

Ardhi Inayomilikiwa	**Shamba na. 1**	**Shamba na. 2**	**Shamba na. 3**	**Shamba na. 4**	**Shamba na. 5**
Ukubwa wa shamba					
Umbali toka nyumbani hadi kwenye shamba					

Je unalazimika kukodi shamba la mtu ili kulima kujipatia mazao ya kaya? Ndiyo/Hapana

Iwapo ndivyo, ni ekari ngapi?.....Na unalipia kiasi gani cha pesa kwa kila ekari moja.....(Tsh)

b) Aina ya mazao yanayolimwa; na kiasi cha eneo lililotengwa kwa kilimo cha mazao hayo mnamo mwaka 1986/au mwaka ulioanza kujishughulisha na kilimo cha mahindi na hatimaye mwaka 2005 (jazajedwali Na. 3).

Jedwali Na. 3: Mazao Yanayolimwa na Ukubwa wa Mashamba Husika

Na.	Aina ya zao	Ekari ulizopanda zao hilo mwaka 1986/au ulipoanza kujishughulisha na kilimo cha mahindi(taja mwaka)	Ekari ulizopanda zao hilo mwaka 2005
1	Mahindi		
2	Tumbako		
3	Ulezi		
4	Mengineyo (Yaorodheshe)		
5			
6			
7			
8			

c) Je unatumia njia ipi ya ukatuaji kuandaa shamba lako kwa ajili ya upandaji wa mazao?

i) Trekta ( ) ii) Jembe la kukokotwa na Ngo'mbe/wanyama ( )

iii) hukwatui (Zero-tillage) ( ) iv) Jembe la mkono ( ) v) Njia nyingineyo (taja).....( )

Ikiwa unatumia trekta/Jembe la kukokotwa na Ngo'mbe je? a) Ni la kwako binafsi ( ) b) au kukodisha ( )

Na je gharama ya kukatua ekari moja kwa kutumia njia zifuatazo ni kiasi gani?

i) Trekta .....(Tsh) ii) Jembe la kukokotwa na Ngo'mbe/wanyama..... (Tsh)

iv) Vibarua wanaotumia Jembe la mkono ..... (Tsh)

d) Chimbuko la nguvu kazi Kuzalisha mazao (Jaza Jedwali na.4).

Jedwali na. 4: Chimbuko la Nguvu Kazi Kuzalisha Mazao

Na.	Aina ya Zao	Kazi zote zilifanya na wanafamilia	Kazi zote zilifanya na Vibarua	Nusu t'amilia; nusu vibarua	Kazi kubwa ilifanywa na wana-familia	Kazi kubwa ilifanywa na vibarua
1	Mahindi					
2	Tumbako					
3	Ulezi					
4	Mengineyo (Yaorodheshe)					
5						
6						
7						
8						

4. Matumizi ya Pembejeo Katika Uzalishaji Mahindi

a) Ni mbegu aina gani unatumia kuzalisha mahindi?

1. Mbegu za asili (Local seeds).....
2. Mbegu Chotara (unuazo kila mwaka toka dukani).....
3. Mbegu Chotara kutoka Mavuno ya Msimu Uliopita.....
4. Zinginezo (zitaje).....

b) Je unaweka mbolea katika Mahindi yako? Ndiyo/Hapana

Iwapo ndiyo, ni ya aina gani?

1. Ya viwandani ( ) 2. Ya Samadi ( ) 3. Nyingineyo (itaje)..... .. ( )

Iwapo mbolea ya viwandani imetumika, ni aina gani na kiasi gani (jazajedwali na. 5)

Jedwali na 5: Aina na Kiasi cha Mbolea ya ChumviChumvi Itumikayo kwa Mahindi

Na.	Aina ya mbolea	Kiasi kilichotumika (kilogramu ngapi kwa hekta)

5. Habari za Uuzaji na Masoko ya Mazao Anayolima Mkulima

Uzalishaji na Mazao mwaka 1986/au ulipoanza kujishughulisha na kilimo cha mahindi(taja mwaka) ..... na mwaka 2005

a) Je unauza sehemu ya mazao uzalishayo? Ndiyo/Hapana

Iwapo ndiyo, onyesha kiasi cha mazao uuzacho kwa kila mteja wako, katika jedwali lifuatalo:

Jedwali Na. 6: Uuzaji na Soko kwa Mazao ya Mkulima

Na.	Soko la mkulima	Kiasi cha Mahindi Kiliehouzwa	Kiasi cha Tumbako Kilichouzwa	Kiasi cha Ulezi Kilichouzwa	Kiasi cha Zao Jingine (litaje) Kilichouzwa	Kiasi cha Zao Jingine (litaje) Kilichouzwa
1	Hifadhi ya Nafaka ya Taifa					
2	Vyama vya Ushirika					
3	Wafanyi biashara wadogowadogo					
4	Wafanyi-biashara wakubwa Wilayani					
5	Wafanyi-biashara wakubwa nje ya Wilayani					
6	Soko la kijijini					
7	Penginepo (taja)					
8						

b) Je soko unakouza Mahindi yako lipo umbali gani ?

(1). Pungufu ya Kilometa 1( ) 2. Kilometa 2 hadi 5 ( ) (3). Kilometa 6 hadi 10 ( ) 4. Zaidi ya kilometa 10 ( )

c) Je unapataje taarifa kuhusu bei ya Mahindi?

(1). Kutoka kwa Marafiki ( ) 2. Kwa wanunuzi ( ) (3). Kwa vyombo vya habari ( ) 4. Kwingineko (Pataje).....

d) Ni kiasi gani cha mazao ulizalisha na kuuza mwaka 1986 au ulipoanza kujishughulisha na kilimo cha mahindi(taja mwaka) ..... na 2005?

Jedwali na. 7: Kiasi cha Mazao Yaliyouzwa na Mkulima

Na.	Aina ya Mazao	Kiasi kilicho-zalishwa (kwa kilo) mwaka 1986 au ulipoanza kujishughulisha na kilimo cha mahindi(taja mwaka)	Kiasi kilichouzwa (kwa kilo) mwaka 1986 au ulipoanza kujishughulisha na kilimo cha mahindi(taja mwaka)	Kiasi kilicho-zalishwa (kwa kilo) mwaka 2005	Kiasi kilicho-uzwa (kwa kilo) mwaka 2005
1	Mahindi				
2	Tumbako				
3	Ulezi				
4	Mengineyo (Yataje)"				
5					
6					

e) Bei ya mahindi mwaka 1986/ au ulipoanza kujishughulisha na kilimo cha mahindi (taja mwaka) ..... ilikkuwa ni kiasi gan?i.....(Tsh)

f) Bei ya mahindi mwaka 2005 ilikkuwa ni kiasi gani?.....(Tsh)

g) Ni nani anatawala mapato yatokanayo na mauzo ya mazao katika kaya yako (Jaza jedwali na. 8).

Jedwali Na. 8: Umiliki wa Mazao Katika Kaya Kijinsia

Na.	Aina ya mazao	Mwanamume	Mwanamke	Wote wawiii Mume na Mke	Wengineo (wataje)
1	Mahindi				
2	Tumbako				
3	Ulezi				
4	Mengineyo (Yataje)				
5					
6					
7					
8					

6. **Matumizi ya Huduma za Ugani (Extension services)Kilimo**

a) Je unatafuta ushauri wa kilimo? Ndiyo/Hapana

Iwapo ndiyo, toka kwa nani?

1. Bwana-kilimo wa Kijiji/Kata/Tarafa 2. Majirani/marafiki 3. Wengineo wataje).....

Iwapo hapana, ni kwa nini? .....

.....

7. **Matumizi ya Kaya ya Kipato Kitokanacho na Mauzo ya Mahindi**

a) Kwa kawaida kipato ukipatacho baada ya kuuza mahindi unakitumiaje?

i) kwa kujinunulia chakula ( )

ii) kwa kujinunulia nguo ( )

(iii) kwa kulipa karo za wanafunzi ( )

iv) kwa kununulia madaftari na vitabu kwa ajili ya watoto ( )

v) kwa ujenzi wa nyumba ( )

vi) kununua uwanja ama shamba ( )

vii) kuanzisha biashara ndogondogo ( )

viii) Mengineyo (yataje) .....

b) Je kipato chenu/chako kutokana na uuzaji wa mahindi kimeongezeka tangu mwaka 1986 au tangu mwaka mwingine [utaje]..... ulipoanza kilimo cha mahindi? Ndiyo /Hapana

i) Iwapo ndiyo, kwa kiasi gani(kwa asilimia)?.....

ii) Iwapo Hapana, kwa nini ?.....

c) Je kama kaya, matumizi yenu ya fedha zitokanazo na uuzaji wa mahindi, yameongezeka baada ya mwaka 1986 au tangu mwaka mwingine [utaje] .....ulipoanza kilimo cha mahindi? NDIYO/HAPANA

i) Iwapo ndiyo, kwa kiasi gani (kwa asilimia)?.....

ii) Iwapo Hapana, kwa nini?.....

8. **Raslimali Walizomudu Kuwa Nazo Wakulima Wa Mahindi Mkoani Rukwa Mwaka 1986 (Au Mwaka Mwingine [Utaje] Ulipoanza Kilimo Cha Mahindi) Na Zile Walizomudu Kumiliki Baada Ya Mwaka 2005.**

Jedwali Na. 9: Raslimali Mkulima wa Mahindi Alizomiliki Mwaka 1986 (Wwakati wa Uanzishwaji wa Soko Huria la Mahindi)/Mmwaka mwi ingine [utaje] Ulipoanza Kilimo cha Mahindi.....

Na.	Raslimali	Thamani (Kwa Tshs.....)
	JUMLA	

Jedwali Na. 10: Raslimali za Mkulima wa Mahindi Mwaka 2006 (Miaka ishirini baada ya kupitishwa kwa Sera ya soko huria la mahindi)

Na.	Raslimali	Thamani (Kwa Tshs.....)
	JUMLA	

9. Ni nini mtazamo wako kwa ujumla kuhusu uzalishaji wa mahindi kijijini mwenu?

.....

.....

10. Ukijenga katika mtazamo wako binafsi onyesha mwitikio wako kwa kauli zifuatazo kwa kuweka alama ya vema katika kisanduku husika katika Jedwali na. 11.

Wazo husika	Nakubali Kabisa	Nakubali	Sina uamuzi	Sikubali	Sikubali Kabisa
Serikali ilikuwa sahihi kuruhusu soko huria la mahindi					
Serikali ihusike kikamilifu katika ununuzi wa ma					
Serikali iruhusu wafanya-biashara toka nje ya nchi waje kununua mahindi yako moja kwa moja					
Serikali ipange bei ya mahindi yako					
Serikali iwadhibiti wanunuzi binafsi wa mahindi ili kumhakikishia mkulima bei bora					

11. Je ni nini maoni yako kuhusu soko la mahindi kijijini mwako?

.....

.....

12. Ni matatizo yapi unayokumbana nayo katika uzalishaji mahindi?

i).....

ii).....

iii).....

iv).....

v) .....

vi).....

13 (a) Vyanzo vyako vingine vya mapato ni vipi?

1. Mifugo.....
2. Vibarua nje ya ukulima.....
3-Ajira ya kulipwa.....
4.Ruzuku (fedha toka kwa jamaa/watoto).
5. Biashara.....
6. Vingine (Vitaje).....

(b) Je vyanzo hivyo vingine huchangia asilimia ngapi ya pato la familia?

1. Mifugo.....
2. Vibarua nje ya ukulima.....
3-Ajira ya kulipwa.....
4.Ruzuku (fedha toka kwa jamaa/watoto).
5. Biashara.....
6. Vingine (Vitaje).....

14. Je ukilinganisha wakati wa sasa (2005/06) na mwaka 1986/au ulipoanza Kujishughulisha na kilimo cha mahindi

ni wakati upi unaweza kusema kwa sasa unamudu gharama za matibabu kwa urahisi? Ndiyo / Hapana
Taja sababu za jibu ulilotoa .....
.....
.....
.....
15. Je ukilinganisha wakati wa sasa (2005/06) na mwaka 1986/au ulipoanza Kujishughulisha na kilimo cha mahindi ni wakati upi unaweza kusema kwa sasa unamudu gharama za masomo ya watoto wako/wnakaya wako? Ndiyo / Hapana
Taja sababu za jibu ulilotoa .....
.....
.....
.....

14. Kulingana na ufahamu wako, maskini ni mtu mwenye sifa zipi?
.....
.....
.....
.....
15. Ni shughuli gani nyingine/zipi ya/za kiuchumi ambayo/ambzzo wadhani yaweza/zaweza kumkomboa mtu dhidi ya umaskini ama kuweza kuboresha maisha yake hapa kijijini kwenu?
a).....sababu.....
b)).....sababu.....
c)).....sababu.....
14. Maoni Mengineyo.....

Ahksante sana kwa ushirikiano wenu/wako katika utafiti huu

Appendix 3.6: Check List to be Used in the Focus Group Discussions and In-depth Interviews in the Research on Maize Market Liberalization and Poverty Reduction in Rural Areas: A Case Study of Rukwa Region, Tanzania

The research you are about to participate in is for a DPhil research for a student pursuing a DPhil (Development Studies) at the University of Sussex, in the United Kingdom and will be used in writing a DPhil thesis.

1. What are the major crops grown in your area?
2. Which of the above mentioned crops are the most important and why?
3. What is the status of maize production in your area?
4. What are the requirements for producing maize in your area?
5. Does maize production in your area have the potential of reducing one's poverty?
6. a) Among men and women what is the level of participation in maize production?

   Give details of level of participation per activity involved.

b) Are youth actively engaged in maize production as a way of fighting their poverty?

   Who participate more between male and female youth?

7. How would you describe maize marketing in your area?

To whom do most farmers sell their maize to in your area?

Table 1 Markets for Farmers Crops

S/No	Farmer's market outlet	Amount of maize sold	Amount of tobacco sold	Amount of finger millet sold	Amount of other crop sold (specify)	Amount of other crop sold (specify)
1.	National Grain Reserve (NGR)					
2.	Cooperative Society					
3.	Crop Vendors					
4.	Big Traders in the District					
5.	Big Traders from outside the District					
6.	Local market					
7.	Other (specify)					

How far are the markets?

8 What other crops can be used in one's fight against poverty in your area?

9. How actively do farmers seek agricultural extension services?

On what matters do they seek extension services

10. On what items do most households spend their income from Maize on?
11. What is your general view of maize production in your area?
12. Based on your personal view indicate your reaction to the following statements by placing a tick in the corresponding box in Table 2.

Table 2: Respondents View on Liberalization of the Maize Market

	Strongly agree	Agree	Can't decide	Disagree	Strongly disagree
The Government was right in liberalizing the maize market					
The Government should be responsible in the purchase of your maize					
The Government should allow traders from outside Tanzania to come and buy your maize directly					
The Government should set a price for your maize					
The Government should regulate the buying of maize by private traders to ensure farmers get better prices					

13. What is your general view of maize marketing in your area?

14. What problems do you encounter in your maize production?

15 a) what inputs (e.g. fertilizers, improved seeds etc) used in agricultural production do you have access to in your area?

b) How do you get the above said inputs?

16 a) What prices do you get for your crops/

Maize.....

Rice.....

Finger millet.....

Tobacco.....

Others (specify).....

b) How much profit per acre can an individual get from the above mentioned crops?

Maize.....

Rice.....

Finger millet.....

Tobacco.....

Others (specify).....

17. What is your definition of a poor person?

18. How can the poor in your area get out of their poverty?

Thank you very much for your cooperation in this research

Appendix 3.7: Informed consent form for the DPhil research titled: Maize Market Liberalization and Poverty Reduction in Rural Areas: A case Study of Rukwa Region, Tanzania

This research you are about to participate in is a partial Requirement for Justin K. Urassa, a lecturer at Sokoine University of Agriculture, Morogoro Tanzania who is currently studying for A Dhil (Development Studies) at the University of Sussex, in the United Kingdom.

The research neither has direct potential benefits nor potential hazards to you as a respondent. However, benefits to you as a respondent might come at a later stage should the thesis emanating from the research reach policy makers who may then use some of the information generated in policy formulation in relation to the Tanzanian agricultural sector.

Data protection

Primary data from the research will be summarized in table or any other suitable form (charts, graphs) which will then be presented in the thesis. And this will be the only form that third parties may have access to it.

Confidentiality and anonymity

The research being undertaken expects to keep all information given by respondents confidential and anonymous. The information gathered from the questionnaires and any in-depth interviews will be reported as that of a group and not as from a particular individual.

Participation in this research is on a voluntary basis.

Please if you agree to participate in the current research tick in the box below

I do agree voluntarily participate in the research

☐

Appendix 3.8 (Translated version of Appendix 3.8): Fomu ya Ukubali wa Wakulima wa Mahindi Mkoani Rukwa Kushiriki Utafiti Unaohusu Ulegezwaji Wa Masharti ya Soko la Mahindi na Upunguzaji wa Umasikini Mkoani Rukwa, Tanzania

Utafiti huu ambao unatarajia kushiriki ni hitaji la msingi kwa ajili ya kumwezesha ndugu Justin K. Urassa ambaye ni Mhadhiri wa Chuo Kikuu cha Sokoine cha Kilimo, Morogoro na ambaye kwa hivi sasa anasomea Shahada ya Falsafa (PhD) katika Chuo Kikuu cha Sussex nchini Uingereza kuweza kutunukiwa shahada yake hiyo baada ya kumaliza masomo yake hapo mwaka 2008 au 2009.

Utafiti huu hauna manufaa ya moja kwa moja kwako kwa hivi sasa. Hata hivyo, manufaa kwako na kwa jamii inayojihusisha na kilimo cha mahindi yanaweza kupatikana hapo baadaye iwapo Serikali ya Tanzania itatumia habari za utafiti huu katika uandaaji au uboreshaji wa sera za sekta ya kilimo.

Utunzaji wa Taarifa, Takwimu na Kumbukumbu za Utafiti Huu

- Taarifa, takwimu na kumbukumbu za utafiti huu zitatumika kuandaa tasnifu ya shahada ya falsafa (PhD) na zitawasilishwa kwa muhtasari katika majedwali, michoro na njia nyinginezo zinazofaa. Na ni kwa njia hii peke yake mtu mwingine ataweza kupata habari za utafiti huu na si vinginevyo.

Hakikisho la Usiri wa Taarifa Unayotoa

Utafiti huu ambao unatarajia kushiriki utahakikisha taarifa zote za mazungumzo yetu ni siri na hakuna mtu ye yote awae atakayepewa taarifa hizi bila indhini yako.

Ushiriki Katika Utafiti Huu

Ushiriki katika utafiti huu ni wa hiari kabisa na mtu asiyetaka kushiriki anaruhusiwa kufanya hivyo.

Tafadhali kama umeridhia kushiriki katika utafiti huu kwa hiari yako mwenyewe naomba uweke saini katika sehemu iliyotengwa hapo chini.

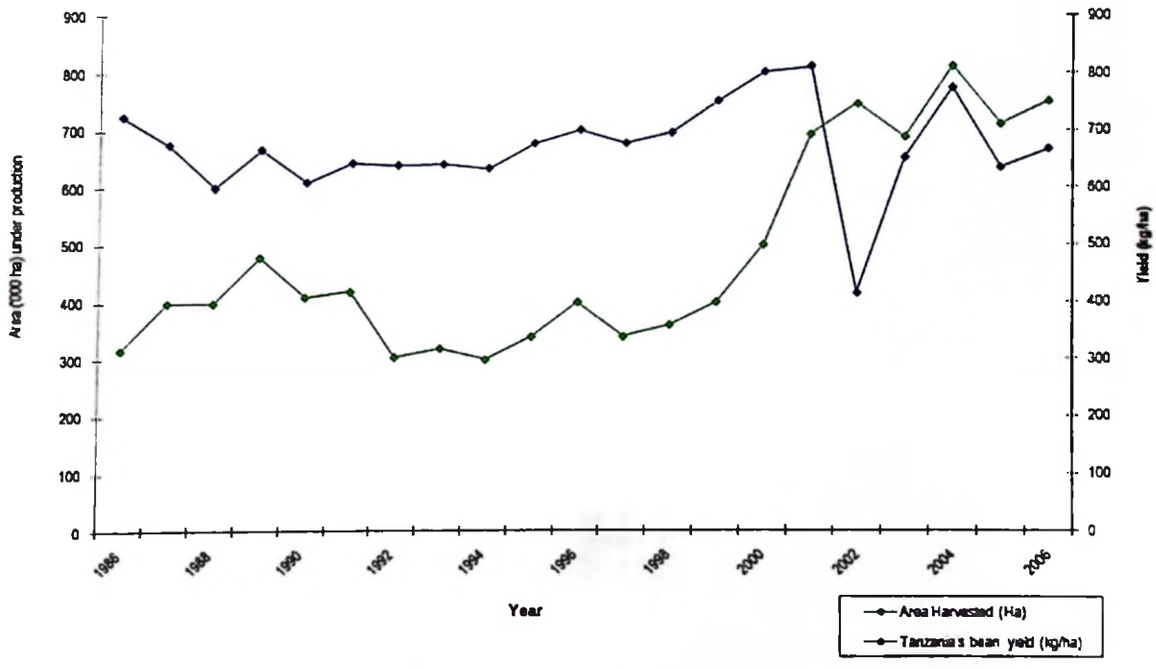
Sahihi ya mshiriki.....Tarehe.....Kijiji.....

Appendix 4.1: Categorization of Tanzania's mainland regions based on their average maize production for the period 1983/84 – 2002/03

Maize production category	Regions in the category	Maize production ('000) tones
Low	Coast, Dar es Salaam, Dodoma, Kagera, Kigoma, Lindi, Mara, Mtwara and Singida	3.6 – 77.6
Medium	Kilimanjaro, Morogoro, Mwanza, Tabora and Tanga	103 - 142
High	Arusha*, Iringa, Mbeya, Ruvuma, Shinyanga and Ruvuma	184 – 274.8

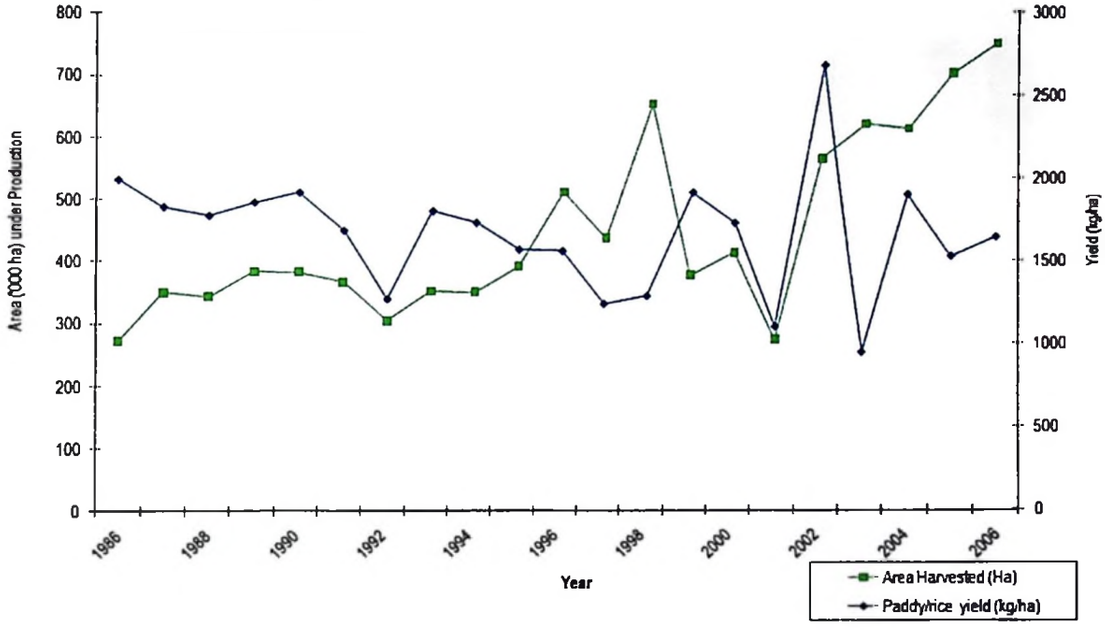
Nb: *This region was divided into the two regions of Arusha and Manyara in 2002, but for the sake of consistency they will be referred together as Arusha as most of the data used with the exception of 2002/03 was based on the undivided Arusha.

Appendix 4.2: Tanzania's bean production trend 1986 -2006



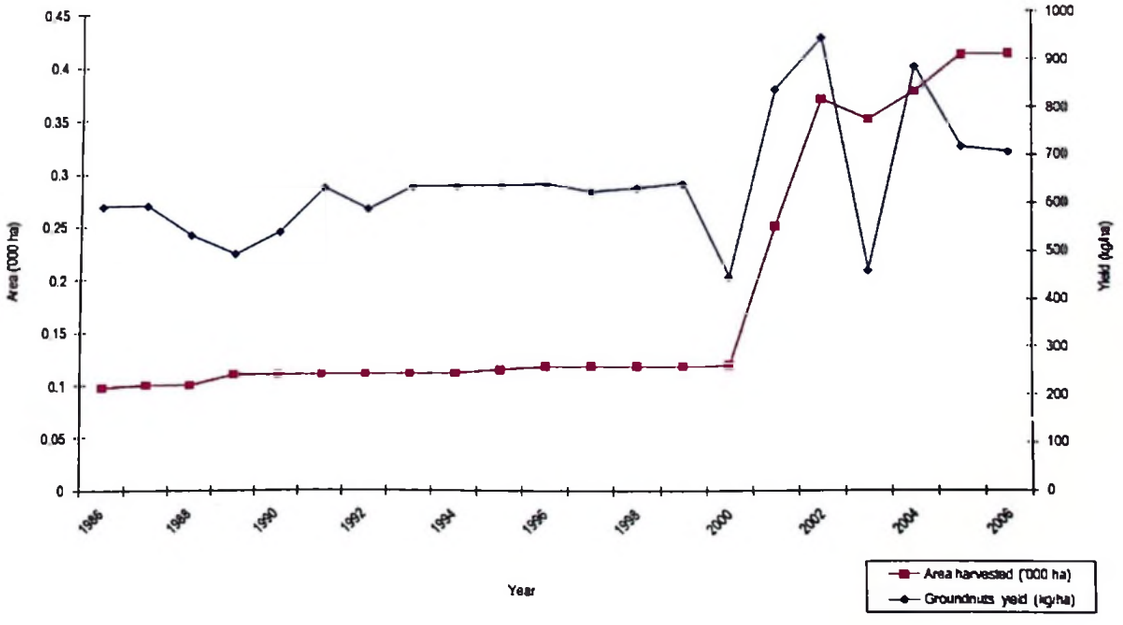
Source: The above graph has been constructed using data from FAOSTAT Online (November, 2009)

Appendix 4.3:Tanzania's paddy/rice production trends 1986 - 2006



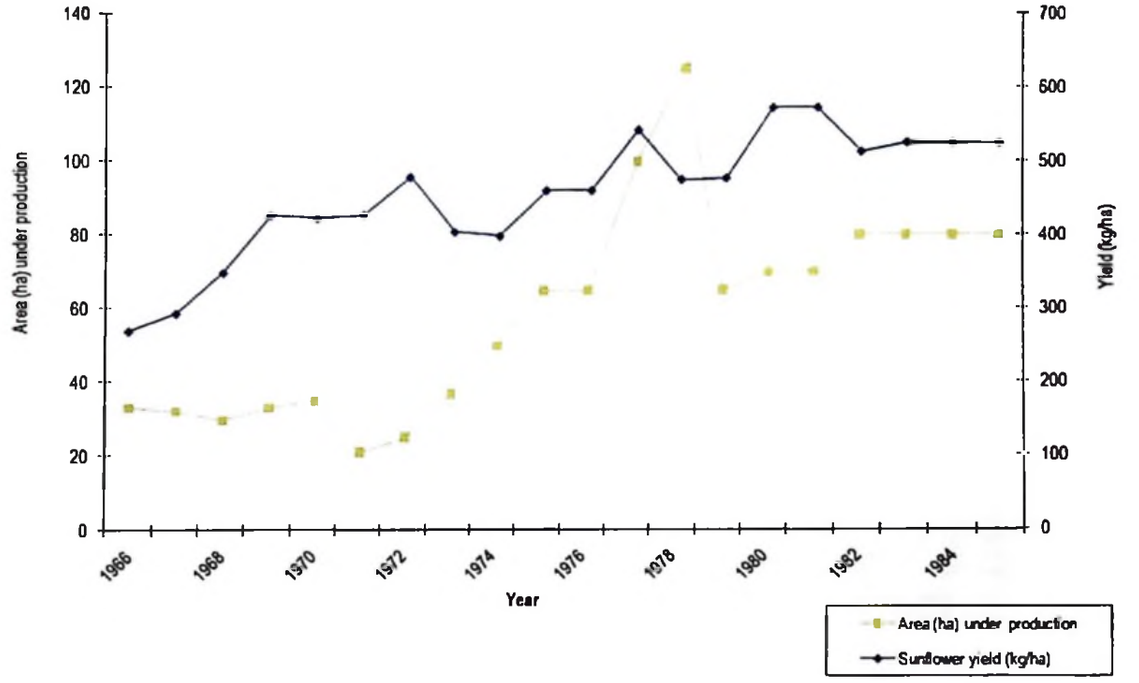
Source: The above graph has been constructed using data from FAOSTAT Online (November, 2009)

Appendix 4.4: Tanzania's groundnut production 1986 - 2006



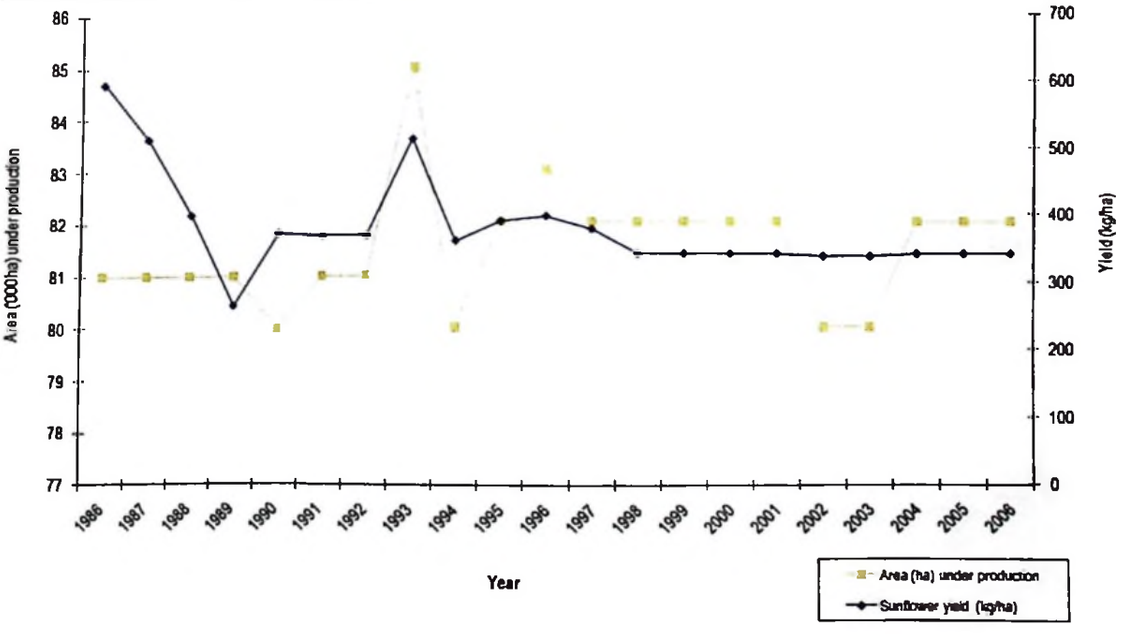
Source: The above graph has been constructed using data from FAOSTAT Online (November, 2009)

Appendix 4.5:Tanzania's sunflower production trend 1966 - 1985



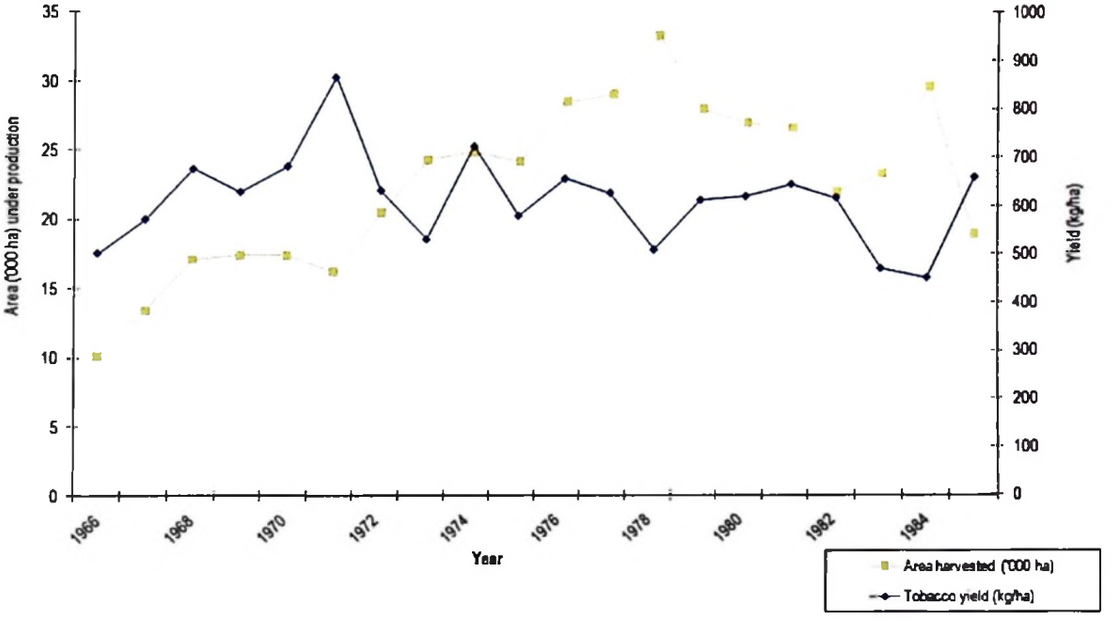
Source: The above graph has been constructed using data from FAOSTAT Online (November, 2009)

Appendix 4.6: Tanzania's sunflower production trend 1986 - 2006



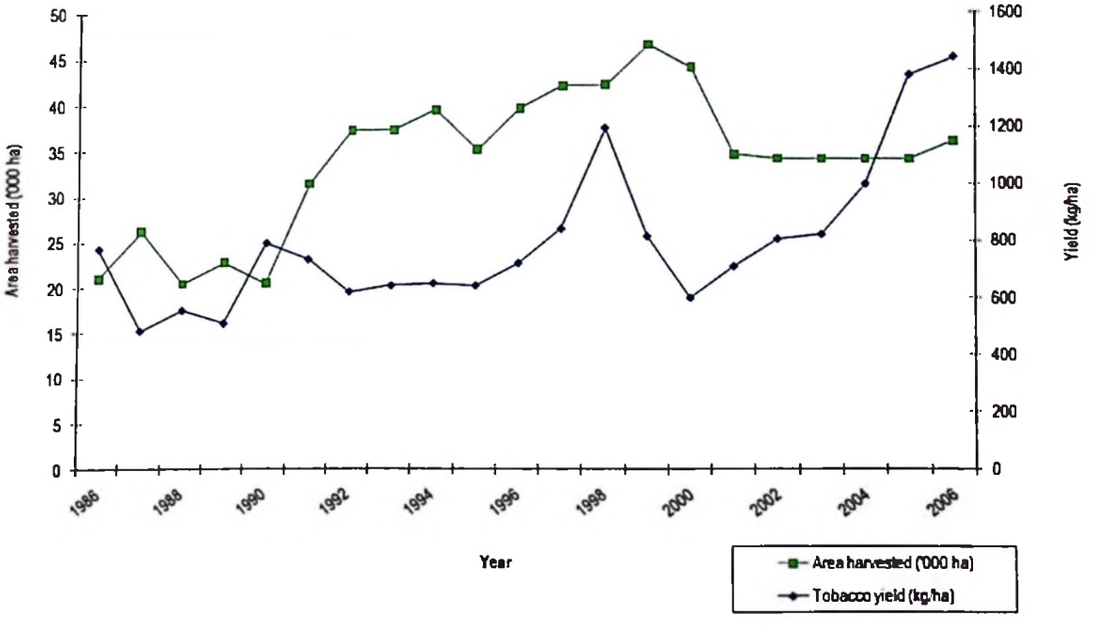
Source: The above graph has been constructed using data from FAOSTAT Online (November, 2009)

Appendix 4.7: Tanzania's tobacco production trend 1966 - 1985



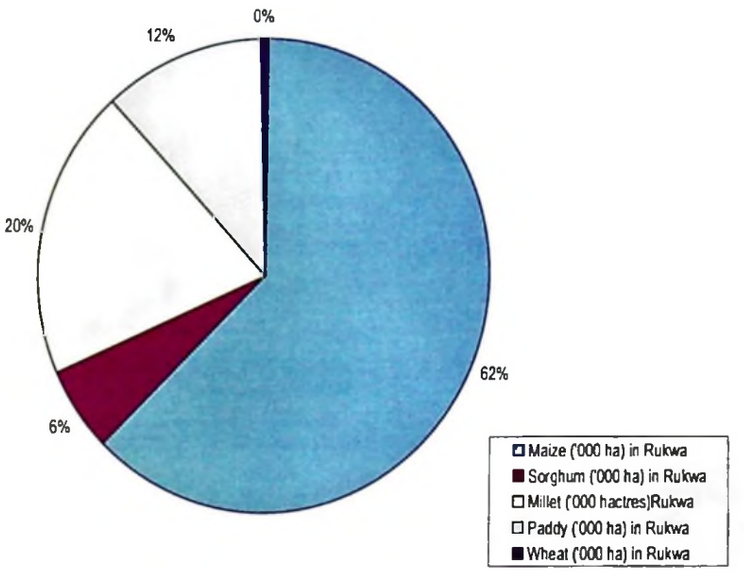
Source: The above graph has been constructed using data from FAOSTAT Online (November, 2009)

Appendix 4.8: Tanzania's tobacco production trends 1986-2006



Source: The above graph has been constructed using data from FAOSTAT Online (November, 2009)

Appendix 4.9: Rukwa's percentage land allocation to major cereals, 1983/84 - 2004/05



Source: The graph has been constructed using data adapted from Ashimogo (1995: Appendix 2.2: 313) for the period 1962 – 1982/83 and the basic data for Agricultural Sector booklets covering the periods 1983/84-1987/88, 1986/87-1991/92, 1993/94-1999/2000, 1995/96-2002/03 and 1998/99 – 2004/05. The data is compiled by the statistics unit of the Ministry of Agriculture/ MAFC

Appendix 4.10: A Summary of Tanzania's Farming Systems

Farming System	Region/Area Practiced	Main Crops Cultivated	Main characteristics
Banana/Coffee/ Horticulture system	Kagera, Kilimanjaro, Arusha, Kigoma and Mbeya regions	Tree crops	- high intensive land use - volcanic soils with high fertility -land scarce
Maize/Legume system	Rukwa, Ruvuma, Arusha, Kagera, Shinyanga, Iringa, Mbeya, Kigoma, Tabora, Tanga, Morogoro, Kahama, Biharamulo	Maize & legumes, beans and groundnuts intercropped, Arabic coffee	-plenty of farming land -shifting cultivation
Cashew/Coconut/Cassava system	coast region; eastern Lindi and Mtwara	Cassava, coconut and cashew	-low rainfall -low soil fertility -plenty of farming land -shifting cultivation
Sorghum/Bulrush millet/Livestock system	Sukumaland; Shinyanga and rural Mwanza	Sorghum, millet, maize and cotton, oilseeds and rice	
Tea/Maize/ Pyrethrum system	Njombe and Mufindi districts in Iringa region	Tea, Maize, Irish potatoes, beans, wheat, pyrethrum, wattle trees and sunflower	-intense population pressure - declining soil fertility
Cotton/Maize system	Mwanza, Shinyanga Kagera, Mara, Singida, Tabora and Kigoma, Morogoro, Coast, Mbeya, Tanga, Kilimanjaro and Arusha	Cotton, sweet potatoes, maize, sorghum and groundnuts	-Intensive cultivation -livestock keeping
Horticulture based system	Lushoto district; Tanga region, Morogoro rural; Morogoro region and Iringa rural in Iringa region	-Vegetables (cabbages, tomatoes, sweet pepper, cauliflower, lettuce and indigenous vegetables) -fruits, (pears, apples, plums, passion fruits and avocado - Maize, coffee -Irish potatoes, tea and beans	

Wet – rice and irrigated system	Kilombero, Wami Valleys, Kilosa, Lower Kilimanjaro, Ulanga, Kyela, Usangu and Rufiji.	Rice	- Occupies river valleys and alluvial plains
Pastoralist and Agro-pastoralist system	Dodoma, Singida, parts of Mara and Arusha; Chunya districts, Mbeya and Igunga district in Tabora	Sorghum and millet	- Deep attachment to livestock and simple cropping system - Moderate population density (30 per sq km) - Limited resource base and poor and variable rainfall (semi-arid areas) -Shifting cultivation for sorghum and millet

NB: Table is based on Tanzania's Ministry of Agriculture Categorization (MAFC, 2007)

Appendix 4.11: Agro-Ecological zones of Tanzania

Zones	Sub-zones and areas	Soil and topography	Altitude (m)	Rainfall (mm/yr)	Area million ha
I Coast	North: Tanga (except Lushoto), Coast and Dares Salaam South : Eastern Lindi and Mtwara (except Makonde plateau)	Infertile sands on gently rolling uplands. Alluvial soils in Rufiji sand and infertile soils Fertile soils on uplands and river flood plains	Under 300	North Bimodal, 750 –1200 South: Unimodal 800 - 1200	6
II Arid lands	North: Serengeti and Ngorogoro Parks, Part of Massai land Massai steppe Taragire Park, Mkomazi reserve, Pangani and Eastern Dodoma	North: Volcanic ash and sediments. Soils variable in texture and very susceptible to water erosion. South: Rolling plains of reddish sandy clays of low fertility. Susceptible to water erosion. Pangani river floodplain with Saline/alkaline soils	North: 1300-1800 South: 500 - 1500	North: Unimodal, Unreliable: 500-600 South: Unimodal, unreliable, 400-600	
III Semi arid lands	Central Dodoma, Singida, N. Iringa, some parts of Arusha and Shinyanga Southern Morogoro (except Kilombero and Wami basin and Uluguru mountains), also Lindi and SW Mtwara	Central: Undulating plains, with rocky hills and low scarps. Well-drained soils with low fertility. Alluvial hardpan and saline soils in eastern Rift Valley and Lake Eyasi Black cracking soils in Shinyanga. South-eastern: Flat or undulating plains with rocky hills. Moderately Fertile loam and clay in South (Morogoro). Infertile sands in centre	Central: 1000-1500 South-eastern 200-600	Central: Unimodal and unreliable 500-800 Southern: Unimodal: 600-800	21.1
IV Plateaux	Western: Tabora, Rukwa (North and Centre), Mbeya (North), Kigoma, part of Mara Southern: Ruvuma and Southern Morogoro	Western: wide sandy plains and rift valley scarps. Flooded swamps of Malagarasi and Ugalla rivers Clay soils with high Fertility. Sands in north	800-1500	Western: Unimodal 800-1000 Southern: Unimodal, very reliable, 900-1300	32.7
V Southern and Western highlands	Southern: A broad ridge from N. Morogoro to N. lake Nyasa, covering part of Iringa and Mbeya South-western: Ufipa plateau in Sumbawanga Western: along the shore of lake	Southern: Undulating plains to dissected hills and mountains. Moderately fertile soils, with volcanic soils in Mbeya. South western: Undulating plateaux above rift valleys. Sandy soils of low fertility. Western: North-South ridges separated by swampy	Southern: 1200-1500 South-western: 1400-2300 Western: 100-1800	Southern: Unimodal, reliable, local rain shadows, 800-1400 South-Western: Unimodal, Reliable,	12.8

	Tanganyika in Kigoma and Kagera	valleys. Loam and clay soils of low fertility in hills with alluvium and clays in valley ponds.		800-1000 Western: Bimodal 1000-2000	
VI Northern highlands	Northern: Foot of Mt Kilimanjaro and Mt Meru, Eastern Rift to Lake Eyasi Granitic mts: Uluguru Mountain In Morogoro, Pare mts. In Kilimanjaro and Usambara Mts. In Tanga, Tarime Highlands in Mara.	Northern: Volcanic uplands, volcanic soils from lava and ash. Deep fertile loam and clays. Soils in dry areas prone to water erosion. Granite mts. Steep mt. Sides to highland Plateaux. Soils are deep friable and moderately fertile on upper slopes: shallow and stony on steep slopes	North: 100-2500 Granitic Mts: 100 - 2000	Northern: Bimodal, Varies widely: 1000-2000	
VII Alluvial plains	K-Kilombero (Morogoro) R-Rufiji (Coast) U-Usangu (Mbeya) W-Wami (Morogoro)	K-Central clay plain with alluvial fans East and West R-Wide mangrove swamp delta. Alluvial soils, sandy upstream, loamy downstream In flood plains. U-Seasonal alluvial fans with well drained black loam in West.		K-Unimodal, Very reliable, 900-1300 R-Unimodal, Often Inadequate 800-1200 U-Unimodal, 500-800 W-Unimodal, 600-1800	19.2

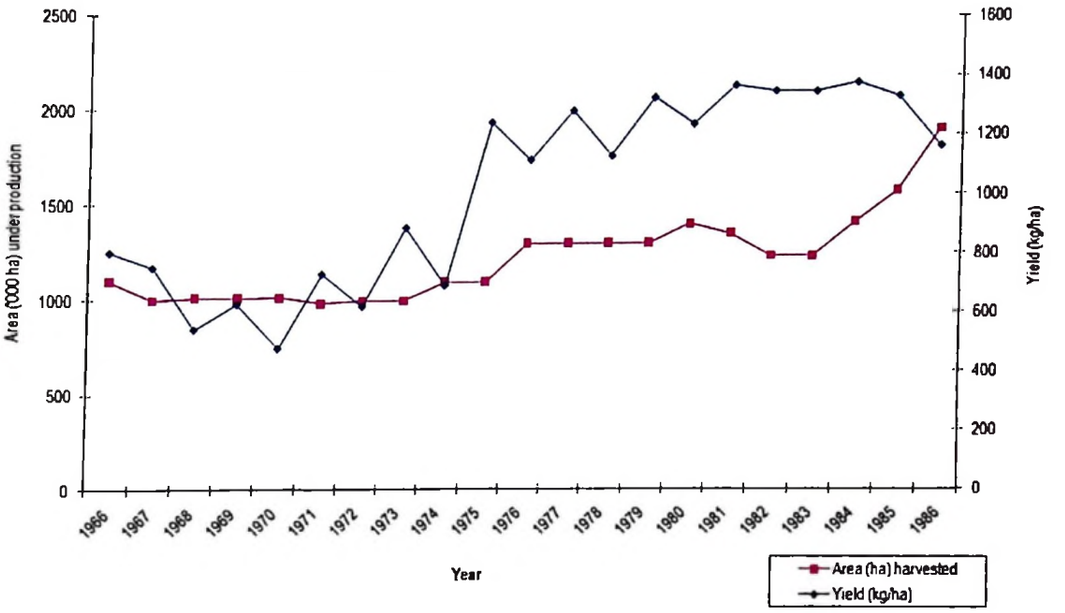
Source: URT/VPO (1999). Proposed National Action Programme to Combat Desertification. Vice President's Office, August 1999

Appendix 4.12: Maize area and yield by region, Tanzania as per the 2002/2003 Agricultural Census

Region	Area (ha) planted with maize	Maize yield (ton/ha)	Area Planted (ha) as per maize Growing Household
Arusha	99,986	0.9	0.73
Coast	70,319	0.3	0.8
Dar es Salaam	3,635	0.3	0.37
Dodoma	345,887	0.4	1.33
Iringa	253,887	1	0.93
Kagera	102,342	1	0.26
Kigoma	83,896	1.3	0.31
Kilimanjaro	96,593	1.1	0.45
Lindi	71,470	0.3	0.56
Manyara	187,898	0.8	1.28
Mara	91,804	1.2	0.56
Mbeya	231,743	1.2	0.71
Morogoro	195,090	0.6	0.8
Mtwara	72,015	0.4	0.44
Mwanza	208,512	0.7	0.69
Rukwa	150,033	1.1	0.94
Ruvuma	139,000	1.3	0.78
Shinyanga	400,270	0.5	1.14
Singida	137,277	0.4	1.02
Tabora	232,860	0.6	1.01
Tanga	287,476	0.6	0.93
Tanzania	3,461,993	0.76	0.76

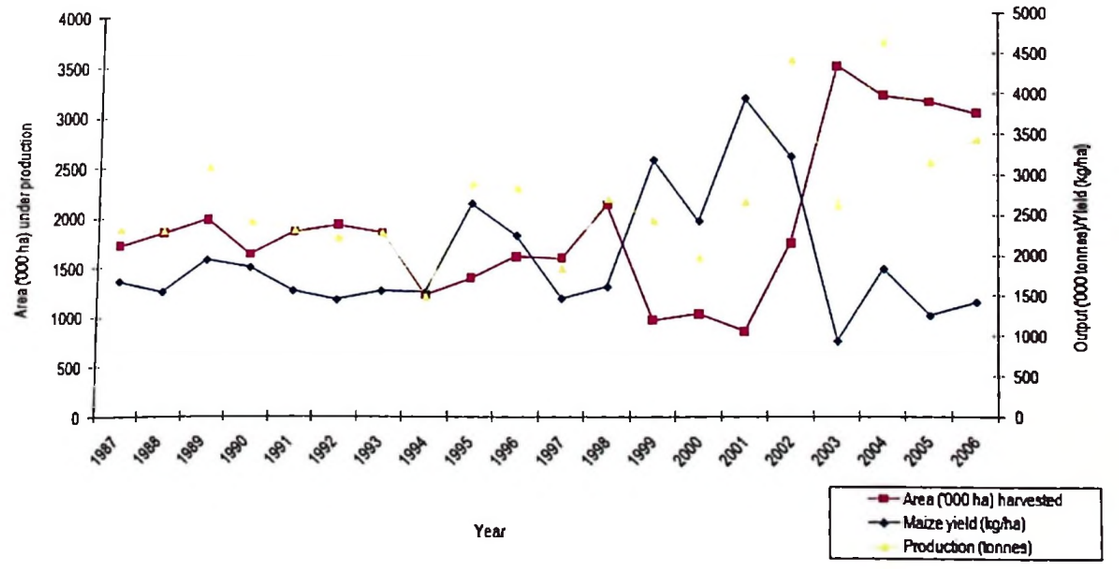
Source; NBS et al. (2006) National Sample Census of Agriculture 2002/2003, Small Holder Agriculture Volume II: Crop Sector-National Report (data obtained from Maps 2.16, 2.17 and 2.18)

Appendix 4.13: Tanzania's maize production trend 1966 - 1986



Source: The above graph has been constructed using data from FAOSTAT Online (November, 2009)

Appendix 4.14: Tanzania's maize production trend 1986 - 2006



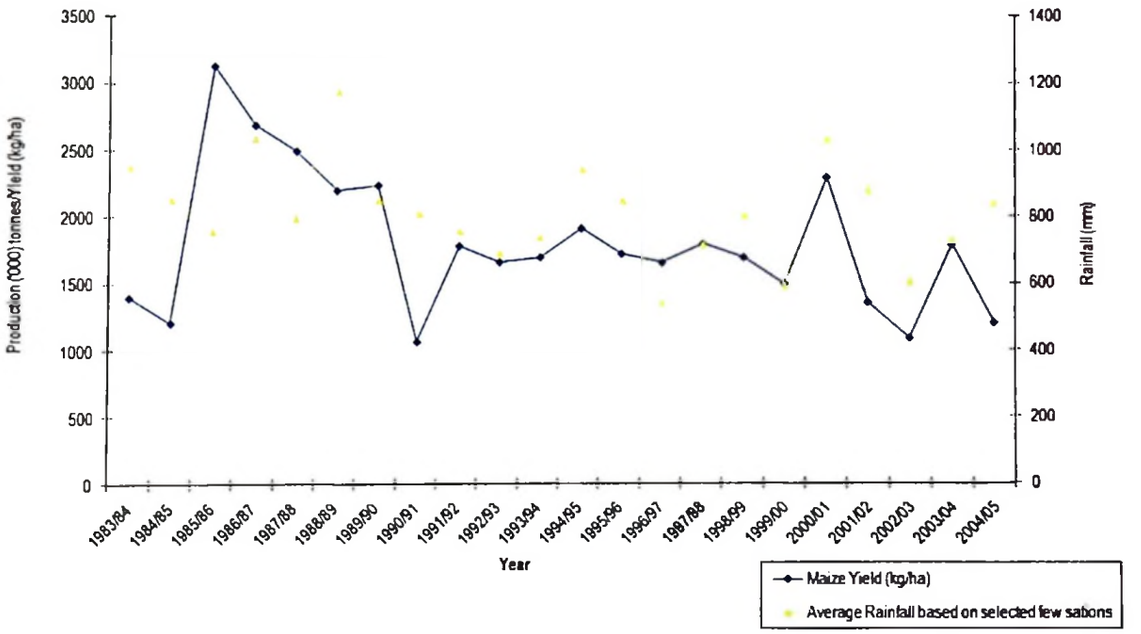
Source: The above graph has been constructed using data from FAOSTAT Online (November, 2009)

Appendix 4.15: Correlation analysis results for average wholesale price and maize output, yield and area cultivated

		Average maize wholesale price for previous season
Maize output in '000 tonnes	Pearson Correlation	.573*
Maize yield (kg/ha)	Pearson Correlation	.100
Area (ha) under maize production	Pearson Correlation	.595*

*. Correlation is significant at the 0.05 level (2-tailed).

Appendix 4.16: Rukwa's rainfall, maize production and yield trends for the period 1983/84 - 2004/05



Source: The graph has been constructed using data adapted from Ashimogo (1995: Appendix 2.2: 313) for the period 1962 – 1982/83 and the basic data for Agricultural Sector booklets covering the periods 1983/84-1987/88, 1986/87-1991/92, 1993/94-1999/2000, 1995/96-2002/03 and 1998/99 – 2004/05. The data is compiled by the statistics unit of the Ministry of Agriculture/ MAFC

Appendix 4.17: Correlations analysis results for rainfall and maize yield in Rukwa region for the period 1983/84 – 2004/05

		Maize yield kg/ha
Rukwa's average rainfall (mm)	Pearson Correlation	**.545***

* Correlation is significant at the 0.05 level (2-tailed).

Appendix 5.1: Crop diversification combinations by households in 2005

Characteristic	Rukwa region n=200	District		
		Sumbawanga n=72	Mpanda n=67	Nkansi n=61
Maize only	22 (11)	10	7	5
Maize and beans	21 (10.5)	12	2	7
Maize and rice	13 (6.5)	7	4	2
Maize and millet	2	2	0	0
Maize and sorghum	1	1	0	0
Maize and cassava	9 (4.5)	6	3	0
Maize and sunflower	8 (4)	4	1	3
Maize and groundnuts	2	0	1	1
Maize and tobacco	7 (3.5)	1	6	0
Maize and oilseeds	1	0	1	0
Maize beans and sunflower	17 (8.5)	5	0	12
Maize, millet and beans	4 (2)	1	0	3
Maize, rice and beans	1	0	1	0
Maize, sunflower and rice	1	1	0	0
Maize, beans and groundnuts	3	0	1	2
Maize, groundnuts and sweet potatoes	2	0	1	1
Maize, groundnuts and oilseeds	1	0	1	0
Maize, oilseeds and potatoes	1	0	1	0
Maize, tobacco and cassava	3	0	3	0
Maize, rice and cassava	5	0	4	1
Maize, tobacco and beans	4 (2)	0	4	0
Maize, rice and tobacco	2	0	1	1
Maize, cassava and sugarcane	1	0	1	0
Maize, cassava and vegetables	1	1	0	0
Maize, sunflower and groundnuts	1	0	1	0
Maize, tobacco and groundnuts	4 (2)	0	4	0
Maize, beans and cassava	1	1	0	0
Maize, beans and potatoes	1	0	0	1
Maize, beans and cowpeas	1	0	0	1
Maize, rice and groundnuts	2	0	0	2
Maize, rice and vegetables	2	0	0	2
Maize, rice and sweet potatoes	1	0	1	0
Maize, beans and groundnuts	2	0	0	2
Maize, cassava and groundnuts	2	0	0	2
Maize, cassava and sweet potatoes	1	0	0	1
Maize , sunflower, beans and groundnuts	3	2	0	1
Maize , millet, sunflower and wheat	1	1	0	0

Maize , millet, beans and sunflower	3	2	0	1
Maize, rice, cassava and sugarcane	1	1	0	0
Maize , rice, beans and sunflower	1	1	0	0
Maize, rice, cassava and vegetables	1	1	0	0
Maize, beans, sunflower and sugarcane	1	1	0	0
Maize, cassava, groundnuts and vegetables	1	1	0	0
Maize, rice, cassava and ground nuts	1	0	0	1
Maize, rice, potatoes and vegetables	1	1	0	0
Maize, millet, beans and tobacco	1	0	1	0
Maize, beans, cassava and vegetables	1	0	1	0
Maize, beans, groundnuts and tobacco	5 (2.5)	0	5	0
Maize , rice, beans and potatoes	1	0	1	0
Maize, cassava, bananas and vegetables	2	0	1	1
Maize, cassava, sunflower and ground nuts	2	0	1	0
Maize, potatoes, tobacco and vegetables	1	0	1	0
Maize, millet, beans and cassava	1	0	0	1
Maize, beans, sunflower and sweet potatoes	1	0	0	1
Maize, beans, bananas and sugar cane	1	0	0	1
Maize, beans, ground nuts and sugar cane	1	0	0	1
Maize, millet, beans, sunflower and ground nuts	3	3	0	0
Maize, rice, cassava, ground nuts and tobacco	1	0	1	0
Maize, millet, cassava, ground nuts and tobacco	1	0	1	0
Maize, rice, cassava, beans and tobacco	1	0	1	0
Maize, cassava, beans, ground nuts and tobacco	1	0	1	0
Maize, millet, beans, sunflower and vegetables	1	0	0	1
Maize, millet, cassava, beans and sunflower	1	0	0	1
Maize, cassava, beans, sunflower, ground nuts, potatoes and tobacco	1	0	1	0
Maize, rice, beans, ground nuts, sweet potatoes and tobacco,	1	0	1	0
Beans only*	1	0	0	1
Rice only*	1	1	0	1
Rice and bananas	1	0	1	0
Rice and vegetables*	1	1	0	0
Cassava only*	1	1	0	0
Sunflower and ground nuts*	1	1	0	0
No crops grown in 2005	2	2	0	0

Source: Survey data 2006; *NB*: Numbers in parentheses refer to percentage * of reporting households that did not cultivate maize in 2005 for various reasons such as illness or shortage of land, however in previous years they grew the crops.

Appendix 5.1a: Correlations analysis results for various farm characteristics by age and education level of household's head

		Household's head age	Actual school years of household's head
No of crops grown by Household in 2005	Pearson Correlation	-.035	.142*
Maize farm land as % of farm land	Pearson Correlation	.124	-.235**
Maize farm land as % of food crop farm land	Pearson Correlation	.049	-.121
Food crop land as a % of farm land	Pearson Correlation	.129	-.191**
Cash crop land as % of farm land	Pearson Correlation	-.129	.191**

*. Correlation is significant at the 0.05 level (2-tailed).
**. Correlation is significant at the 0.01 level (2-tailed).

Appendix 5.2: Correlations analysis results between various socio-economic characteristics of the household heads and number of crops grown by households

		No of crops grown by Household in 2005	No of LS adopted by household	No of farming plots owned by household
Household's head age	Pearson Correlation	-.035	-.104	.064
Actual school years of household's head	Pearson Correlation	.142*	.162*	-.021
Household size	Pearson Correlation	.079	.018	-.079
Number of children under 15	Pearson Correlation	.128	.055	-.031
Household's income in 2005	Pearson Correlation	.247**	.055	.004
Household's farmed land in 2005	Pearson Correlation	.496**	.018	.000
Area under maize as % of farm land in 2005	Pearson Correlation	-.419**	.006	.035
Area under food production as % of farm land in 2005	Pearson Correlation	-.249**	.008	.112
Area under cash crop production as % of farm land in 2005	Pearson Correlation	.384**	.048	-.160*
No of farming plots owned by household	Pearson Correlation	.007	.093	na
No of crops grown by household in 2005		na	.119	.007

NB: **. Correlation is significant at the 0.01 level (2-tailed) and *. Correlation is significant at the 0.05 level (2-tailed).

Appendix 5.3: ANOVA Results for some of households socio-economic characteristics and their influence on a households diversification of crops grown on basis of land allocated to maize production. Food crops and cash crops

Source of variation	Dependent variable	df	Mean Square	F	Sig.
Sex of Household's head	Farmed land in 2005	1	26.921	9.557	0.002**
	% of farm land (ha) allocated to maize in 2005	1	816.395	1.233	0.268
	% of farm land allocated to food crops in 2005	1	584.376	1.222	0.270
	% of farm land allocated to cash crops in 2005	1	328.224	.800	0.372
	No of crops grown by household in 2005	1	3.879	2.891	0.091*
Crop sales or non-sale	Farmed land in 2005	3	18.478	6.843	0.000***
	% of farm land (ha) allocated to maize in 2005	3	2650.191	4.191	0.007**
	Farm land (ha) allocated to maize as a % of land allocated to food crops	3	1863.167	2.625	0.052**
	% of farm land allocated to food crops in 2005	3	2022.719	4.444	0.005**
	% of farm land allocated to cash crops in 2005	3	2038.235	5.298	0.002**
	No of crops grown by household in 2005	3	9.960	8.146	0.000***
District	Farmed land in 2005	2	2.077	.705	0.495
	% of farm land (ha) allocated to maize in 2005	2	1528.188	2.337	0.099*
	% of farm land allocated to food crops in 2005	2	4827.764	11.107	0.000***
	% of farm land allocated to cash crops in 2005	2	5690.056	15.981	0.000***
	No of crops grown by household in 2005	2	6.605	5.077	0.007**
Tillage method	Farmed land in 2005	1	31.494	11.273	0.001***
	% of farm land (ha) allocated to maize in 2005	1	1049.335	1.588	0.209
	% of farm land allocated to food crops in 2005	1	2811.915	6.021	0.015**
	% of farm land allocated to cash crops in 2005	1	1649.865	4.090	0.044**
	No of crops grown by household in 2005	1	5.104	3.822	0.052**
Farm size	Farmed land in 2005	1	300.797	209.801	0.000***
	% of farm land (ha) allocated to maize in 2005	1	2398.149	3.667	0.057*
	% of farm land allocated to food crops in 2005	1	5046.389	11.072	0.001***
	% of farm land allocated to cash crops in 2005	1	7208.011	19.205	0.000***
	No of crops grown by household in 2005	1	70.500	70.139	0.000***
Farm fragmentation	Farmed land in 2005	1	31.494	11.273	0.001***
	% of farm land (ha) allocated to maize in 2005	1	404.115	.609	0.436
	% of farm land allocated to maize as a proportion of food crops	1	4925.096	6.976	0.009**
	% of farm land allocated to food crops in 2005	1	4100.614	8.904	0.003**
	% of farm land allocated to cash crops in 2005	1	2387.959	5.975	0.015**
	Average number of crops grown by households in 2005	1	17.184	13.484	0.000***

Source: Survey data 2006

Appendix 5.4: ANOVA results for some of households' socio-economic characteristics and households LS

Source of variation	Sum of Squares	df	Mean Square	F	Sig.
District	2.261	2	1.131	1.073	.344
Sex of household's head	1.711	1	1.711	1.572	.211
Education	**5.033**	**1**	**5.033**	**4.865**	**.029****
Income	.420	1	.420	.397	.529
Actual farmed land	.199	1	.199	.187	.665
Household's sale of maize	.375	1	.375	.354	.552
Crop sales	1.461	3	.487	.458	.712

Source: Survey data 2006 *NB*: **Significant at 0.05 level

Appendix 5.5: ANOVA results for number of plots owned, household size and number of children less than 15 years as per household head's gender

Source of variation	Sum of Squares	df	Mean Square	F	Sig.
No of farming plots owned by household	.044	1	.044	.028	.868
Household size	2.716	1	2.716	.403	.526
Number of children under fifteen years or still in school	2.758	1	2.758	.571	.451

Source: Survey data 2006

Appendix 5.6: Households' socio-economic characteristics on basis of the education of household heads

Characteristic		Household head's education level	
		Less than 7 years (n = 73)	More than 7 years (n = 127)
District	Sumbawanga district	24 (32.9)	48 (37.8)
	Mpanda district	19 (26)	48 (37.8)
	Nkansi district	30 (41.1)	31 (24.4)
Households socio-economic characteristics	Household size	5.79	5.94
	Average farm size	2.11	2.39
	Average number of plots owned	2.19	1.94
	Households using hand hoe	39 (53.4)	74 (58.3)
	Households using oxen/draught power	34 (46.6)	53 (41.7)
	Average number of crops grown in 2005	2.49	2.79
	Average annual income in 2005	409, 517	586,572
	Average household assets value in 2006	1,565,815	1,762,544
	Household provides all the labour required for crop production	32(43.8)	24(18.9)
	Household uses both family and hired labour for crop production	41(56.2)	103 (81.1)
Household's engagement in other LS	Livestock keeping	30 (41.1)	74 (58.3)
	Employment	1 (1.4)	9 (7.1)
	Casual labour	20 (27.4)	40 (31.5)
	Trade	24 (32.9)	67 (52.8)
	Remittances	16 (21.9)	19 (15)
	Local brew	9 (12.3)	3 (2.4)
	Fishing	4 (5.5)	7 (5.5)
	Average number of LS	2.47	2.80

Source: Survey data 2006; *NB*: Numbers in parentheses refers to percentage

Appendix 5.7: Households' socio-economic characteristics on basis of reported 2005 total income

Characteristic	Household income status in 2005	
	Households able to spend at least one USD per day (n = 72)	Households not able to spend at least one USD per day (n = 128)
Household head's age	41.03	46.29
Household head's years of schooling	6.07	4.82
Household size	5.81	5.93
Average farm size	3.07	1.86
Average number of plots owned	2.14	1.97
Average number of crops grown in 2005	3.06	2.47
Average annual income (Tsh) in 2005	524,400	181,602
Household provides all the labour required for crop production	40(31.2)	61(47.7)
Household uses both family and hired labour for crop production	88(68.8)	67 (52.3)
Livestock keeping	43 (59.7)	61 (47.7)
Employment	7 (9.7)	3 (2.3)
Casual labour	16 (22.2)	44 (34.4)
Trade	34 (47.2)	57 (44.5)
Remittances	9 (12.5)	26 (20.5)

Source: Survey data 2006; *NB*: Numbers in parentheses refer to percentage

Appendix 5.8: ANOVA results for households' income status and farm land owned in 2005

Source of variation	Sum of Squares	df	Mean Square	F	Sig.
Households reported 2005 total income	67.420	1	67.420	25.808	.000

Appendix 5.9: Activity status of Tanzania's children (5 – 17) in 2000/2001

Activity	Dar es Salaam	Other Urban	Rural	Total
Economic Activities	41,892	374,174	4,319,462	4,735,528
Housekeeping	530,319	1,149,532	4,041,645	5,721,496
School only	49,179	137,896	239,526	426,601
Idle	23,917	203,794	853,809	1,081,520
Total	645,307	1,865,396	9,454,442	11,965,145
Participation Rates				
Economic Activities	6.5	20.0	45.7	39.6
Housekeeping	82.2	61.6	42.7	47.8

Source: IPEC/MLYDS/NBS (2000/2001).

Appendix 5.10: T-test results for households in maize production in 1986: paired sample test for farm land, % of farm allocated to maize, other food crops and cash crops

		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower	Upper			
Pair 1	% of farm allocated to maize in 2005 – % of farm allocated to maize in 1986	4.481	36.872	3.953	-3.378	12.339	1.133	86	.260
Pair 2	% of farm allocated to cash crops in 2005 - % of farm allocated cash crops in 1986	5.961	21.979	2.356	1.276	10.645	2.530	86	.013
Pair 3	% of farm allocated other food crops in 2005 - % of farm allocated other food crops in 1986	-10.441	36.776	3.943	-18.279	-2.603	-2.648	86	.010
Pair 4	Households' farm size in 2005 – Households' farm size in 1986	.22858	2.420	.259	-.287	.744	.881	86	.381

Source: Survey data 2006

Appendix 6.1: Productivity (kg/ha) of selected food and cash crops for selected regions of Tanzania for the 2004/05 season

Characteristic	Crop	Tanzania	Arusha	Kilimanjaro	Iringa	Mbeya	Ruvuma	Rukwa*	Surveyed households
Food Crops	Maize	1007.08	1195.95	1264.52	1483.40	1338.59	1387.14	1203.32	1057.48
	Rice	1534.28	4051.96	5204.14	1750.19	2170.50	1403.89	1761.95	1535.68
	Beans	772.30	927.14	574.85	814.89	648.72	716.57	679.19	446.55
Cash Crops	Groundnuts	717.95	-	365.38	1020.83	662.80	540.82	473.61	552.50
	Sunflower	927.83	733.33	311.83	839.18	518.87	6.14.41	784.54	634.20
	Tobacco++	858.32	1000.00	600.00	-	1000.00	600.00	1000.00	794.05

Source: Own survey 2006, ++data from district agricultural offices (Sumbawanga, Mpanda and Nkansi) and basic agriculture and livestock data booklet for 2005. * Rukwa's average for 2001/02 (848 flue cure and 350 fire cured)

Appendix 6.2: Average crop yields (Kg/ha) across the world

Crop	Season	Eastern Africa	Northern Africa	Southern Africa	Asia	Eastern Europe	South America	Mexico	World
Maize	1986 -19 90	1385.54	3627.36	1939.76	2949.74	3603.92	2083.66	1772.48	**3502.84**
	1991 - 1995	1281.42	3949.56	1854.16	3483.46	3236.18	2533.62	2270.02	**3824.48**
	1996 - 2000	1441.78	5260.86	2380.16	3722.80	3428.38	3069.86	2379.90	**4309.30**
	2001 - 2005	1360.28	5779.10	2769.60	3923.52	4050.66	3673.20	2757.40	**4623.54**
Dry beans	1986 - 1990	739.66	1394.08	1162.28	568.80	958.56	484.26	535.98	**605.40**
	1991 - 1995	703.66	1372.26	928.24	571.58	1274.92	621.02	642.24	**648.8**
	1996 - 2000	587.18	1399.16	1175.10	625.20	1227.98	695.80	610.80	**687.66**
	2001 - 2005	599.66	1840.40	1213.90	654.26	1558.82	795.84	694.28	**722.32**
Rice	1986 - 1990	1888.58	6253.56	3529.40	3443.98	3587.00	2346.12	3620.6	**3364.22**
	1991 - 1995	1877.76	7712.12	3011.72	3695.82	2984.04	2804.08	4451.98	**3614.00**
	1996 - 2000	1859.40	8560.74	2368.52	3908.24	2879.18	3440.62	4428.96	**3840.88**
	2001 - 2005	2016.32	9539.98	2324.10	4028.16	3728.36	3963.84	4568.72	**3966.76**
Groundnuts	1986 - 1990	583.00	711.98	933.18	1236.74	1137.88	1620.44	1183.54	**1166.38**
	1991 - 1995	541.22	813.52	989.96	1386.50	981.12	1544.32	1291.00	**1235.90**
	1996 - 2000	593.46	798.40	1590.68	1680.84	884.02	1476.96	1447.78	**1409.60**
	2001 - 2005	629.58	877.04	1398.40	1853.86	695.74	1695.32	1511.90	**1539.26**
Sunflower seeds	1986 - 1990	536.86	766.38	984.94	1003.58	1514.34	1357.48	548.40	**1360.04**
	1991 - 1995	477.30	700.52	815.22	920.22	1172.82	1658.82	1191.44	**1209.50**
	1996 - 2000	573.24	848.54	1265.68	986.42	991.08	1690.30	905.80	**1226.48**
	2001 - 2005	726.62	996.44	1291.08	965.30	1141.46	1684.00	2010.60	**1224.42**
Tobacco	1986 - 1990	1203.04	1153.36	1164.92	1390.56	1780.40	1508.22	1589.96	**1475.16**
	1991 - 1995	1409.28	1163.48	1355.04	1462.64	1501.90	1647.52	1744.88	**1547.60**
	1996 - 2000	1456.58	1123.70	1905.98	1540.92	1435.64	1729.58	1760.34	**1608.34**
	2001 - 2005	1238.58	1305.60	2103.80	1587.34	1521.98	1874.62	1872.78	**1645.98**

Source: the above yields have been calculated using data from FAOSTAT (http://faostat.fao.org/site-[21/10/2009], data on the site was recorded as Hg/ha whereby 1 hg = 100 grams

Appendix 6.3 Maize marketing by surveyed households in 2005

Characteristic	Rukwa Region n = 191	District		
		Sumbawanga n = 66	Mpanda n = 66	Nkansi n = 59
Households selling maize in 2005 as a % of those who produced it[154]	53.93	59.1	30.30	74.58
Average amount sold (kg) in 2005[a]	713.04	833.33	297.73	1,043.05
Amount sold as a % of maize produced in 2005[a]	26.96	34.53	12.07	35.15

Source: Own survey 2006, *NB*: [a] Calculations have been made on basis of all households growing maize in 2005.

Appendix 6.4: Surveyed households maize marketing summary statistics on basis of buyer

	Household sales maize to Small Crop Traders (n = 60)	Household sales maize in local market (n = 27)	Household sales maize to Large Crop Traders within district (n = 11)	Household sales maize to Large Crop Traders outside district (n =4)	Strategic Grain Reserve SGR (n=1)
Maize sale range (kg)	100 – 15,000	20 – 2,000	100 – 4,000	600 – 7,000	n.a
Average 2005 maize price per 100 kg	14,175	12,785	14,000	11,375	10,000
Maize price range (Tsh) (2005)	5,000 – 42,000	6,000 – 20,000	9,000 -21,000	8,000 – 15,500	n.a

Source: Own survey 2006

Appendix 6.5: Distribution of surveyed households based on size of maize output

District	Size of maize output	
	Small(i.e. ≤ 1800 kg) n = 139	Large (i.e. ≥1800 kg) n = 52
Sumbawanga	47 (33.8)	19 (36.5)
Mpanda	58 (41.7)	8 (15.4)
Nkansi	34 (24.5)	25 (48.1)

Source: Own survey 2006, *NB*: Numbers in brackets indicate percentage

Appendix 6.6: Distribution of surveyed households based on maize market distance

District		Distance to maize market	
		Less than 1 Km n = 83	More than 1 Km n = 20
Average amount of maize sold		1,163.7	1,980.0
Average price received		12,972.7	15,525.0
Median price		12,000.0	15,000.0
Main buyer	Strategic Grain Reserve (SGR)	1 (1.2)	0 (0.0)
	Small Crop traders	55 (66.3)	5 (25.0)
	Large Crop traders in district	2 (2.4)	9 (45.0)
	Large Crop traders from outside district	1 (1.2)	4 (20.0)
	Local market	24 (28.9)	2 (10.0)
Size of maize output	Small(i.e. ≤ 1800 kg) (n = 55)	46 (55.4)	9 (45.0)
	Large (i.e. ≥1800 kg) (n = 48)	37 (44.6)	11 (55.0)

Source: Own survey 2006, *NB*: Numbers in brackets indicate percentage

[154] Observations from the study showed that about 75 % of the 191 households that produced maize in 2005 normally sell maize. However, the percentage actually selling maize in 2005 was found to be just above 50%. Unfortunately, the available information the study does not reveal why fewer households sold maize in 2005 than to those reporting that they usually sell it.

Appendix 6.7: Respondents' opinion on maize marketing in their area

Characteristic		Maize price received		Size of maize output	
		≤ 12,000 (Tsh) n =60	≥ 12,000 (Tsh) n = 43)	Small(i.e. ≤ 1800 kg) n = 139	Large (i.e. ≥1800 kg) n = 52
Average maize production (kg) in 2005		2,121.67	2,551.2	608.5	3736.5
Average amount (kg) of maize sold		1,183.17	1,516.3	176.9	2146.2
Average maize price		n.a	n.a	14,655.0	12,483.0
Respondents' opinion on maize marketing in their area	Not happy	51 (85.0)	28 (65.1)	82 (59.0)	41 (78.8)
	Happy	9 (15.0)	13 (30.2)	30 (21.6)	10 (19.2)
	No opinion	0 (0.0)	2 (4.7)	27 (19.4)	1 (1.9)
The government was right in liberalizing the maize market	Agree	17 (28.3)	10 (23.3)	36 (25.9)	13 (25.0)
	Disagree	43 (71.7)	31 (72.1)	91 (65.5)	37 (71.2)
	No opinion	0 (0.0)	2 (4.7)	12 (8.6)	2 (3.8)
The government should participate actively in the maize market	Agree	5 (8.3)	9 (20.9)	17 (12.2)	6 (11.5)
	Disagree	54 (90.0)	34 (79.1)	110 (79.1)	46 (88.5)
	No opinion	1 (1.7)	0 (0.0)	12 (8.6)	0 (0.0)
The government should allow traders from outside Tanzania to buy maize from producers	Agree	34 (56.7)	21 (48.8)	83 (59.7)	24 (46.2)
	Disagree	26 (43.3)	18 (41.9)	45 (32.4)	25 (48.1)
	No opinion	0 (0.0)	4 (9.3)	11 (7.9)	3 (5.8)
The government should set the price of maize	Agree	28 (46.7)	26 (60.5)	64 (46.0)	26 (50.0)
	Disagree	29 (48.3)	15 (34.9)	63 (45.3)	23 (44.2)
	No opinion	3 (5.0)	2 (4.7)	12 (8.6)	3 (5.8)
The government should regulate maize marketing to ensure good prices for producers	Agree	2 (3.3)	7 (16.3)	12 (8.6)	7 (13.5)
	Disagree	57 (95.0)	34 (79.1)	118 (84.9)	43 (82.7)
	No opinion	1 (1.7)	2 (4.7)	9 (6.5)	2 (3.8)

Source: Own survey 2006, *NB*: Numbers in brackets indicate percentage

Appendix 7.1: Paired samples test for adjusted 1986 and 2005 household's annual income and adjusted 1986 and 2006 assets value

		Paired Differences							
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference Lower	Upper	t	df	Sig. (2-tailed)
Pair 1	Household's total asset value in 2006 - adjinc1986	1.14142E6	4.30830E6	4.78700E5	1.88773E5	2.09406E6	2.384	80	.019
Pair 2	Household's income in 2005 - adjinc1986	1.34419E5	8.41775E5	93530.53811	-51713.18069	3.20550E5	1.437	80	.155